

MOTOR AGE

Volume XXXVI
Number 5

PUBLISHED WEEKLY AT THE MALLERS BUILDING
CHICAGO, JULY 31, 1919

Fifteen Cents a Copy
Three Dollars a Year

Note the Permanence of Hudson Dealers

***97% of Our Product is Handled by
Distributors Who Have Been in the Hud-
son Organization Six Years or More***

Ninety per cent is handled by men whose connection is more than 7 years.

These figures tell a graphic story of careful organization welding that is unique in the shifting fortunes and failures that attend so many automobile ventures.

It puts the question straight to you:

Will you connect with a time-proved organization, selling a time-proved car and build yourself into a permanent, profitable future?

Automobile history is strewn with business wrecks. How many automobile manufacturers have failed in the comparatively brief period of the business? They have carried down some excellent and capable dealers with them and their most valuable assets of hard earned prestige was lost.

The sure way to build prosperity and permanence is with a company whose product and organization have won a place of permanence in the business world.

With the Hudson you sell a world-famed car, that confers prestige on the dealer, in any community. Unequalled for achievement, the Hudson Super-Six is the largest selling fine car in the world. It has held this leadership for four years.

A Hudson franchise means more to you than the immediate profits, which it surely brings also. It means association with successful business men and leaders. And it means the greater capital of prestige, which go with the name, the reputation and the deeds of the Hudson.

But perhaps to you the greatest thing that the Hudson franchise stands for is permanence and security for the business you put your heart, head and hand in.

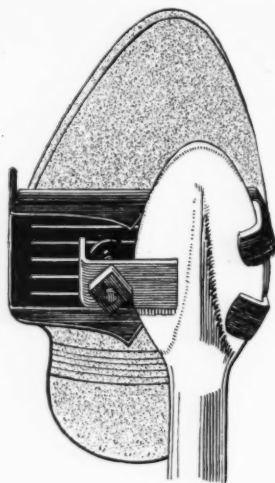
There may be an opening in your territory. At least you should take the opportunity to find out. Write now. It may mean a Hudson connection for you.



Hudson Motor Car Company
Detroit, Michigan

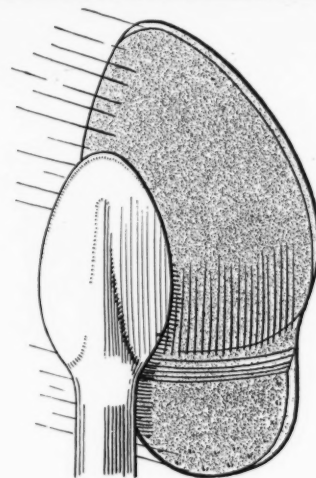
(I)

Look at the Difference Between These Two Pedals



This Driver's Foot
Cannot Slip

A Slip Like This
Might Wreck This Driver's Car



—and You Will Know at Once Why Owners Buy

UTILITY



PEDALS

For Fords

There are only a few of the more than 2 million drivers of Ford cars who are basically reckless, and none out looking for an accident. Most Ford Owners—thousands, even millions of them—take every precaution for safety. Owners call UTILITY pedals "The Absolutely necessary accessory for Fords." The growing demand for them reflects the growing realization on the part of Ford owners that the key to safety in driving any Ford car is a firm, positive grip on the pedals. UTILITY pedals—rubber shod—are absolutely slip-proof. Besides, they are wide enough to hold the driver's whole foot—with a flange for extra protection against slipping, at the side. Making big sales and generous profits for dealers every day. The more you sell, the more you need, to sell.

DEALERS: Order from your jobber

JOBBER: Get in touch with us.

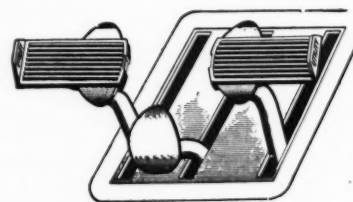
HILL PUMP VALVE COMPANY

Mfrs' of UTILITY Protected Heaters, UTILITY Pedals for Fords, UTILITY Pumps, UTILITY Disappearing Truck Bodies for Fords, UTILITY Universal Rim Wrenches and UTILITY Universal Wrenches.

Archer Avenue and Canal Street

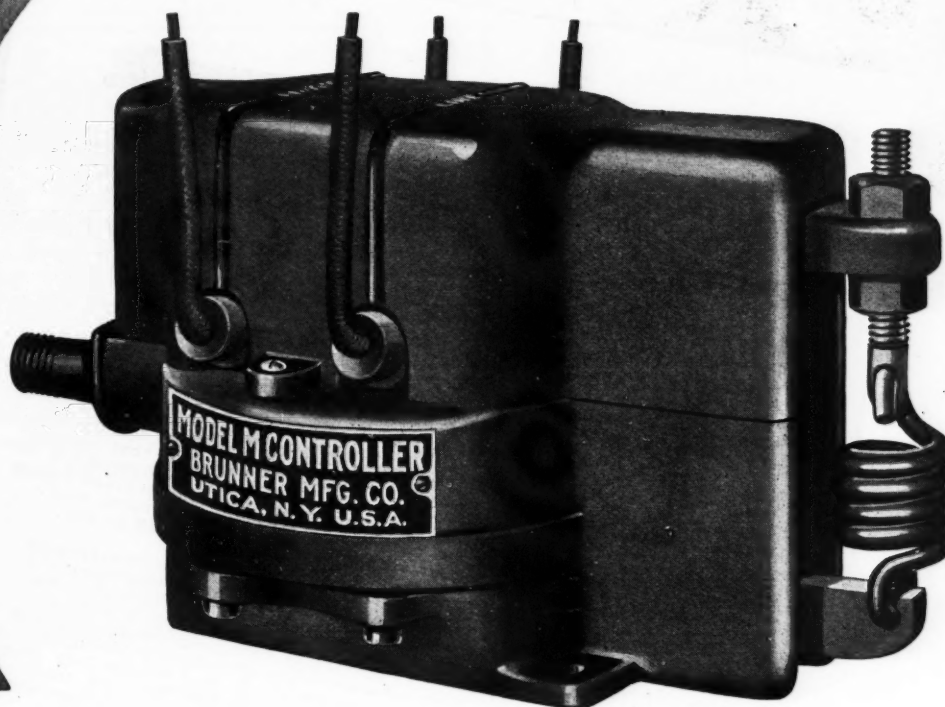
CHICAGO

Sales Department: THE ZINKE CO., 1323 S. Michigan Ave., Chicago



How UTILITY Pedals look from the front seat of a Ford.

Only
\$1.25 per Set

BRUNNER

Controlled Air Service

Your air compressor is in the back room--your profitable time is spent in the front. Suppose you start your compressor and are called away. What will happen if it is not automatically controlled?

- 1st - you may have to leave important, profitable work to go back to shut it off - several times a day this happens. A Brunner Controller will pay for itself in the loss of time and profit.
- 2nd - If your compressor has safety valves, these will open when the proper pressure is reached then you are just pumping into the atmosphere - burning up current and wearing out your machine. A Brunner controller will prevent this.
- 3rd - If your outfit does not have safety valves, the pressure may reach the danger point. A Brunner controller will avoid damage and personal injury.

Suppose on the other hand you forgot or neglected to turn the compressor on, you'll have disappointed customers. A Brunner controller automatically maintains a proper working pressure which means every customer served without delay.

Here again Brunner engineers have designed a special type of controller to meet the most exacting requirements.

A Brunner controller will work on other Compressors - write for details, name your jobber.

BRUNNER MANUFACTURING COMPANY

MAIN OFFICE and FACTORY, UTICA, N. Y.

Branch Cincinnati, Ohio.



Dealers

Your Protection

JENKINS VULCAN SPRING CO.
QUANTITY SERVICE

FACTORY
 RICHMOND, IND.

Automobile Springs

RICHMOND, IND.

May 28, 1919

OFFICE OF THE PRESIDENT

Mr. Seymour Schiele
 Schiele Advertising Co.
 St. Louis, Missouri

Dear Mr. Schiele:-

We are receiving a number of complaints from our men that dealers have been sending in orders to jobbers for VULCAN springs, and that springs have been shipped them which were unsatisfactory. In many cases the dealers seemed to be under the impression that they had received VULCAN springs. Investigation on the part of our road men has proven without exception that these defective springs were not VULCAN at all.

I think it highly desirable that we lay stress in our advertising on the fact that every VULCAN spring is equipped with an indestructible metal name plate, showing our copyrighted trade mark "VULCAN". The original spring equipment on a big majority of the passenger cars and trucks now being produced is proving of very poor workmanship and material. The result is that car owners and dealers are insisting upon a higher grade spring for replacement. We have always felt that when a spring is sold, the buyer is entitled to know who made that spring. Not by word of mouth or insinuation, but by the indisputable evidence of an indestructible trade mark name plate on the spring itself. We know that VULCAN springs go quietly about their business of MAKING GOOD, and we desire that the world should know every VULCAN spring for what it is, and to that end every VULCAN spring is branded with our indestructible metal name plate.

We are using full page Ads. continuously in about 20 of the leading trade papers, as well as full page Ads. in Collier's, Leslie's, Successful Farming, and other papers, and we feel that it is much to our interest, and the interest of the trade and the public that our metal name plate on every spring should be featured in our advertising.

Please see that this is done at once.

Truly yours,

T.B. Jenkins
 President

T.B.J.
 AB



Jenkins VULCAN Spring Co.
 Richmond, Indiana.

MOTOR AGE

Published Every Thursday by
THE CLASS JOURNAL COMPANY

MALLERS BUILDING
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Vol. XXXVI

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No. 5

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MOTOR AGE

MALLERS BUILDING
CHICAGO

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Cable Address "Motage"

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A Summer Profit Booster



2-IN-1 CUT FILLER

Every summer sees an increasing demand for this popular necessity. Dealers find no trouble in selling 2-in-1 Cut Filler—every motorist wants it when he sees it.

2-in-1 Cut Filler permanently seals cuts and bruises in casings—prevents sand and water pockets—keeps little holes from getting bigger.



We Furnish This Display Stand

Put this stand in your window or on your counter. It will sell 2-in-1 Cut Filler without any effort on your part. Order 2-in-1 Cut Filler from your jobber. You will get this display stand with each order.

SEND FOR CATALOG

The complete line of Dutch Brand Products is described, including tire and chemical specialties. Write for it.

VAN CLEEF BROS.

Woodlawn Av., 77th to 78th Sts.

Chicago, U. S. A.



DUTCH BRAND
TRADE MARK



SEVENTY-FIVE PER CENT OF GAS ENGINE TROUBLE IS CAUSED BY CARBON

You can't prevent carbon forming in a Gasoline Motor, it is a dead sure thing.

You know what a carbon knock is, you also know that carbon on the plugs causes missing, and carbon on the valves lets the compression leak away. But do you know that white-hot carbon in the cylinders is the cause of most backfiring? And carbon in the oil is responsible for a large percentage of wear.

Carbon is so hard, it will cut glass. Let a hard crust of it accumulate in the motor and the result is bound to be disastrous.

If you clean out the carbon now and then, you don't prevent scoring, wearing and pitting of metal between times.

You can't prevent carbon forming. But you can prevent its accumulating. Destroy it as it forms, before it does the damage.



**CARBON
DESTROYER
SCIENTIFICALLY
CORRECT**

Provides a simple and practical means of applying Monox Solution—a scientific preparation that will not harm the motor.

You simply open the valve which is installed on the dash, while the motor is running, your cylinders fill with Monox vapor, which is decomposed into hydrogen and carbon monoxide by contact with the red hot carbon and in a few minutes the carbon in the form of carbon-monoxide gas will have disappeared through the exhaust.

The Monox Carbon Destroyer is quickly, easily, and permanently installed on any Motor Car, Truck or Tractor. Attach it in a convenient place and use it occasionally at your convenience. No trouble, and the expense is practically nothing.

It is so simple a child can operate it. The principles are scientifically correct, the performance is perfect and—we guarantee satisfaction.

THE MONOX COMPANY

Offices: 502 Book Building
DETROIT, U. S. A.

**SOME TERRITORY STILL OPEN
FOR LIVE DISTRIBUTORS**



**PRICE
\$10.00**

IN THIS ISSUE

MOTOR AGE editors have been giving a great deal of time and attention to various service problems confronting the dealer who renders service.

One of the biggest problems we hear about is to properly route every repair job so that every detail may be properly taken care of and a correct charge made promptly at the other end of the line. This must be done so that the customer is satisfied that everything ordered has been done satisfactorily and that the charge is correct and ready promptly on completion of the job.

The articles on "Mastering Service Problems With a Master Sheet" that appeared in the July 10th and 17th numbers were a result of investigations and co-operation from the trade. They are forerunners of what we hope may be a standard system for the trade to adopt. This subject is again brought out in the lead article of this number, which consists mostly of suggestions for adapting the system.

No doubt many of you who have read these articles have some very good ideas of your own along these lines and can offer some suggestions that may be of considerable help in assisting us and your fellow members of the trade get a little closer to a standardized master service sheet and a more modern system. Let's have them so we can all pull together. Your suggestions or criticisms are invited.

ELIMINATING THE OIL BARREL PLAGUE

Your attention is called to another article in this number that tells about a scheme which can be used to keep oil barrels off the garage floor. Study it.

AIRPLANE HELPS WIN AUTO RACE

Ever hear of anyone winning an automobile race with the help of an airplane?

We did, and we let you in on it in this issue—read the story on how an aeroplane helped Tommy Milton cash in at Uniontown.

Statements of Importance to Truck Buyers

THE following group of statements made by The White Company in recent advertising summarizes the achievements of the White Product—the White fleet growth, mileage records, honors won in commerce and war; reviews the factors of strength and permanence back of every owner's investment in White Trucks.

All bear on one simple fact: the real value of a motor truck; its ability to do the most work for the least money under all conditions.

"Year after year this list grows. It is something more than a list of well-known concerns owning ten or more White Trucks. It represents a yearly progress in added trucks per owner—the most extensive growth of individual fleets ever published by a truck maker.

"There are now 2774 White Fleets in actual service, totaling 33,139 trucks, exclusive of all single truck installations."

- "The ultimate mileage of White Trucks is still unmeasured. Some have rounded out 300,000 miles. Many have run 200,000 miles. Hundreds, probably thousands, have passed the 100,000 mark—a very common White performance."

"The purchaser of a White Truck backs his investment in it with the strength of The White Company, with its years of successful experience, with its thousands of trained employees, with its tens of thousands of trucks in active service, with its millions of capital and a service organization, nation-wide, which has no parallel in the industry."

The complete statements, in pamphlet form, will be sent upon request

Roll Call

of White Truck Fleets

YEAR after year this list grows. It is something more than a list of well-known concerns owning ten or more White Trucks. It represents a yearly progress in added trucks per owner—the most extensive growth of individual fleets ever published by a truck maker.

The latest of these so many trucks can have no better guide than the experience of those whose trucking volume affords a comparative knowledge of results. There are now 2774 fleets in active service, totaling 33,139 White Trucks, exclusive of all single truck installations.

The list contains details only the first three months of 1919.

Company Name	City	State	Trucks
Acme Truck Co.	Chicago	Ill.	10
Adams Bros.	St. Louis	Mo.	15
Adams Truck Co.	St. Louis	Mo.	20
Adams Truck Co.	St. Louis	Mo.	25
Adams Truck Co.	St. Louis	Mo.	30
Adams Truck Co.	St. Louis	Mo.	35
Adams Truck Co.	St. Louis	Mo.	40
Adams Truck Co.	St. Louis	Mo.	45
Adams Truck Co.	St. Louis	Mo.	50
Adams Truck Co.	St. Louis	Mo.	55
Adams Truck Co.	St. Louis	Mo.	60
Adams Truck Co.	St. Louis	Mo.	65
Adams Truck Co.	St. Louis	Mo.	70
Adams Truck Co.	St. Louis	Mo.	75
Adams Truck Co.	St. Louis	Mo.	80
Adams Truck Co.	St. Louis	Mo.	85
Adams Truck Co.	St. Louis	Mo.	90
Adams Truck Co.	St. Louis	Mo.	95
Adams Truck Co.	St. Louis	Mo.	100
Adams Truck Co.	St. Louis	Mo.	105
Adams Truck Co.	St. Louis	Mo.	110
Adams Truck Co.	St. Louis	Mo.	115
Adams Truck Co.	St. Louis	Mo.	120
Adams Truck Co.	St. Louis	Mo.	125
Adams Truck Co.	St. Louis	Mo.	130
Adams Truck Co.	St. Louis	Mo.	135
Adams Truck Co.	St. Louis	Mo.	140
Adams Truck Co.	St. Louis	Mo.	145
Adams Truck Co.	St. Louis	Mo.	150
Adams Truck Co.	St. Louis	Mo.	155
Adams Truck Co.	St. Louis	Mo.	160
Adams Truck Co.	St. Louis	Mo.	165
Adams Truck Co.	St. Louis	Mo.	170
Adams Truck Co.	St. Louis	Mo.	175
Adams Truck Co.	St. Louis	Mo.	180
Adams Truck Co.	St. Louis	Mo.	185
Adams Truck Co.	St. Louis	Mo.	190
Adams Truck Co.	St. Louis	Mo.	195
Adams Truck Co.	St. Louis	Mo.	200
Adams Truck Co.	St. Louis	Mo.	205
Adams Truck Co.	St. Louis	Mo.	210
Adams Truck Co.	St. Louis	Mo.	215
Adams Truck Co.	St. Louis	Mo.	220
Adams Truck Co.	St. Louis	Mo.	225
Adams Truck Co.	St. Louis	Mo.	230
Adams Truck Co.	St. Louis	Mo.	235
Adams Truck Co.	St. Louis	Mo.	240
Adams Truck Co.	St. Louis	Mo.	245
Adams Truck Co.	St. Louis	Mo.	250
Adams Truck Co.	St. Louis	Mo.	255
Adams Truck Co.	St. Louis	Mo.	260
Adams Truck Co.	St. Louis	Mo.	265
Adams Truck Co.	St. Louis	Mo.	270
Adams Truck Co.	St. Louis	Mo.	275
Adams Truck Co.	St. Louis	Mo.	280
Adams Truck Co.	St. Louis	Mo.	285
Adams Truck Co.	St. Louis	Mo.	290
Adams Truck Co.	St. Louis	Mo.	295
Adams Truck Co.	St. Louis	Mo.	300
Adams Truck Co.	St. Louis	Mo.	305
Adams Truck Co.	St. Louis	Mo.	310
Adams Truck Co.	St. Louis	Mo.	315
Adams Truck Co.	St. Louis	Mo.	320
Adams Truck Co.	St. Louis	Mo.	325
Adams Truck Co.	St. Louis	Mo.	330
Adams Truck Co.	St. Louis	Mo.	335
Adams Truck Co.	St. Louis	Mo.	340
Adams Truck Co.	St. Louis	Mo.	345
Adams Truck Co.	St. Louis	Mo.	350
Adams Truck Co.	St. Louis	Mo.	355
Adams Truck Co.	St. Louis	Mo.	360
Adams Truck Co.	St. Louis	Mo.	365
Adams Truck Co.	St. Louis	Mo.	370
Adams Truck Co.	St. Louis	Mo.	375
Adams Truck Co.	St. Louis	Mo.	380
Adams Truck Co.	St. Louis	Mo.	385
Adams Truck Co.	St. Louis	Mo.	390
Adams Truck Co.	St. Louis	Mo.	395
Adams Truck Co.	St. Louis	Mo.	400
Adams Truck Co.	St. Louis	Mo.	405
Adams Truck Co.	St. Louis	Mo.	410
Adams Truck Co.	St. Louis	Mo.	415
Adams Truck Co.	St. Louis	Mo.	420
Adams Truck Co.	St. Louis	Mo.	425
Adams Truck Co.	St. Louis	Mo.	430
Adams Truck Co.	St. Louis	Mo.	435
Adams Truck Co.	St. Louis	Mo.	440
Adams Truck Co.	St. Louis	Mo.	445
Adams Truck Co.	St. Louis	Mo.	450
Adams Truck Co.	St. Louis	Mo.	455
Adams Truck Co.	St. Louis	Mo.	460
Adams Truck Co.	St. Louis	Mo.	465
Adams Truck Co.	St. Louis	Mo.	470
Adams Truck Co.	St. Louis	Mo.	475
Adams Truck Co.	St. Louis	Mo.	480
Adams Truck Co.	St. Louis	Mo.	485
Adams Truck Co.	St. Louis	Mo.	490
Adams Truck Co.	St. Louis	Mo.	495
Adams Truck Co.	St. Louis	Mo.	500
Adams Truck Co.	St. Louis	Mo.	505
Adams Truck Co.	St. Louis	Mo.	510
Adams Truck Co.	St. Louis	Mo.	515
Adams Truck Co.	St. Louis	Mo.	520
Adams Truck Co.	St. Louis	Mo.	525
Adams Truck Co.	St. Louis	Mo.	530
Adams Truck Co.	St. Louis	Mo.	535
Adams Truck Co.	St. Louis	Mo.	540
Adams Truck Co.	St. Louis	Mo.	545
Adams Truck Co.	St. Louis	Mo.	550
Adams Truck Co.	St. Louis	Mo.	555
Adams Truck Co.	St. Louis	Mo.	560
Adams Truck Co.	St. Louis	Mo.	565
Adams Truck Co.	St. Louis	Mo.	570
Adams Truck Co.	St. Louis	Mo.	575
Adams Truck Co.	St. Louis	Mo.	580
Adams Truck Co.	St. Louis	Mo.	585
Adams Truck Co.	St. Louis	Mo.	590
Adams Truck Co.	St. Louis	Mo.	595
Adams Truck Co.	St. Louis	Mo.	600
Adams Truck Co.	St. Louis	Mo.	605
Adams Truck Co.	St. Louis	Mo.	610
Adams Truck Co.	St. Louis	Mo.	615
Adams Truck Co.	St. Louis	Mo.	620
Adams Truck Co.	St. Louis	Mo.	625
Adams Truck Co.	St. Louis	Mo.	630
Adams Truck Co.	St. Louis	Mo.	635
Adams Truck Co.	St. Louis	Mo.	640
Adams Truck Co.	St. Louis	Mo.	645
Adams Truck Co.	St. Louis	Mo.	650
Adams Truck Co.	St. Louis	Mo.	655
Adams Truck Co.	St. Louis	Mo.	660
Adams Truck Co.	St. Louis	Mo.	665
Adams Truck Co.	St. Louis	Mo.	670
Adams Truck Co.	St. Louis	Mo.	675
Adams Truck Co.	St. Louis	Mo.	680
Adams Truck Co.	St. Louis	Mo.	685
Adams Truck Co.	St. Louis	Mo.	690
Adams Truck Co.	St. Louis	Mo.	695
Adams Truck Co.	St. Louis	Mo.	700
Adams Truck Co.	St. Louis	Mo.	705
Adams Truck Co.	St. Louis	Mo.	710
Adams Truck Co.	St. Louis	Mo.	715
Adams Truck Co.	St. Louis	Mo.	720
Adams Truck Co.	St. Louis	Mo.	725
Adams Truck Co.	St. Louis	Mo.	730
Adams Truck Co.	St. Louis	Mo.	735
Adams Truck Co.	St. Louis	Mo.	740
Adams Truck Co.	St. Louis	Mo.	745
Adams Truck Co.	St. Louis	Mo.	750
Adams Truck Co.	St. Louis	Mo.	755
Adams Truck Co.	St. Louis	Mo.	760
Adams Truck Co.	St. Louis	Mo.	765
Adams Truck Co.	St. Louis	Mo.	770
Adams Truck Co.	St. Louis	Mo.	775
Adams Truck Co.	St. Louis	Mo.	780
Adams Truck Co.	St. Louis	Mo.	785
Adams Truck Co.	St. Louis	Mo.	790
Adams Truck Co.	St. Louis	Mo.	795
Adams Truck Co.	St. Louis	Mo.	800
Adams Truck Co.	St. Louis	Mo.	805
Adams Truck Co.	St. Louis	Mo.	810
Adams Truck Co.	St. Louis	Mo.	815
Adams Truck Co.	St. Louis	Mo.	820
Adams Truck Co.	St. Louis	Mo.	825
Adams Truck Co.	St. Louis	Mo.	830
Adams Truck Co.	St. Louis	Mo.	835
Adams Truck Co.	St. Louis	Mo.	840
Adams Truck Co.	St. Louis	Mo.	845
Adams Truck Co.	St. Louis	Mo.	850
Adams Truck Co.	St. Louis	Mo.	855
Adams Truck Co.	St. Louis	Mo.	860
Adams Truck Co.	St. Louis	Mo.	865
Adams Truck Co.	St. Louis	Mo.	870
Adams Truck Co.	St. Louis	Mo.	875
Adams Truck Co.	St. Louis	Mo.	880
Adams Truck Co.	St. Louis	Mo.	885
Adams Truck Co.	St. Louis	Mo.	890
Adams Truck Co.	St. Louis	Mo.	895
Adams Truck Co.	St. Louis	Mo.	900
Adams Truck Co.	St. Louis	Mo.	905
Adams Truck Co.	St. Louis	Mo.	910
Adams Truck Co.	St. Louis	Mo.	915
Adams Truck Co.	St. Louis	Mo.	920
Adams Truck Co.	St. Louis	Mo.	925
Adams Truck Co.	St. Louis	Mo.	930
Adams Truck Co.	St. Louis	Mo.	935
Adams Truck Co.	St. Louis	Mo.	940
Adams Truck Co.	St. Louis	Mo.	945
Adams Truck Co.	St. Louis	Mo.	950
Adams Truck Co.	St. Louis	Mo.	955
Adams Truck Co.	St. Louis	Mo.	960
Adams Truck Co.	St. Louis	Mo.	965
Adams Truck Co.	St. Louis	Mo.	970
Adams Truck Co.	St. Louis	Mo.	975
Adams Truck Co.	St. Louis	Mo.	980
Adams Truck Co.	St. Louis	Mo.	985
Adams Truck Co.	St. Louis	Mo.	990
Adams Truck Co.	St. Louis	Mo.	995
Adams Truck Co.	St. Louis	Mo.	1000

THE WHITE COMPANY
CLEVELAND

Owners' Records of 100,000 Made by

THE ultimate mileage of White Trucks is still unmeasured. Some have rounded out 300,000 miles. Many have run 200,000 miles. Hundreds, probably thousands, have passed the 100,000 mark—a very common White performance.

Company Name	City	State	Miles
Adams Truck Co.	St. Louis	Mo.	100,000
Adams Truck Co.	St. Louis	Mo.	105,000
Adams Truck Co.	St. Louis	Mo.	110,000
Adams Truck Co.	St. Louis	Mo.	115,000
Adams Truck Co.	St. Louis	Mo.	120,000
Adams Truck Co.	St. Louis	Mo.	125,000
Adams Truck Co.	St. Louis	Mo.	130,000
Adams Truck Co.	St. Louis	Mo.	135,000
Adams Truck Co.	St. Louis	Mo.	140,000
Adams Truck Co.	St. Louis	Mo.	145,000
Adams Truck Co.	St. Louis	Mo.	150,000
Adams Truck Co.	St. Louis	Mo.	155,000
Adams Truck Co.	St. Louis	Mo.	160,000
Adams Truck Co.	St. Louis	Mo.	165,000
Adams Truck Co.	St. Louis	Mo.	170,000
Adams Truck Co.	St. Louis	Mo.	175,000
Adams Truck Co.	St. Louis	Mo.	180,000
Adams Truck Co.	St. Louis	Mo.	185,000
Adams Truck Co.	St. Louis	Mo.	190,000
Adams Truck Co.	St. Louis	Mo.	195,000
Adams Truck Co.	St. Louis	Mo.	200,000
Adams Truck Co.	St. Louis	Mo.	205,000
Adams Truck Co.	St. Louis	Mo.	210,000
Adams Truck Co.	St. Louis	Mo.	215,000
Adams Truck Co.	St. Louis	Mo.	220,000
Adams Truck Co.	St. Louis	Mo.	225,000
Adams Truck Co.	St. Louis	Mo.	230,000
Adams Truck Co.	St. Louis	Mo.	235,000
Adams Truck Co.	St. Louis	Mo.	240,000
Adams Truck Co.	St. Louis	Mo.	245,000
Adams Truck Co.	St. Louis	Mo.	250,000
Adams Truck Co.	St. Louis	Mo.	255,000
Adams Truck Co.	St. Louis	Mo.	260,000
Adams Truck Co.	St. Louis	Mo.	265,000
Adams Truck Co.	St. Louis	Mo.	270,000
Adams Truck Co.	St. Louis	Mo.	275,000
Adams Truck Co.	St. Louis	Mo.	280,000
Adams Truck Co.	St. Louis	Mo.	285,000
Adams Truck Co.	St. Louis	Mo.	290,000
Adams Truck Co.	St. Louis	Mo.	295,000
Adams Truck Co.	St. Louis	Mo.	300,000
Adams Truck Co.	St. Louis	Mo.	305,000
Adams Truck Co.	St. Louis	Mo.	310,000
Adams Truck Co.	St. Louis	Mo.	315,000
Adams Truck Co.	St. Louis	Mo.	320,000
Adams Truck Co.	St. Louis	Mo.	325,000
Adams Truck Co.	St. Louis	Mo.	330,000
Adams Truck Co.	St. Louis	Mo.	335,000
Adams Truck Co.	St. Louis	Mo.	340,000
Adams Truck Co.	St. Louis	Mo.	345,000
Adams Truck Co.	St. Louis	Mo.	350,000
Adams Truck Co.	St. Louis	Mo.	355,000
Adams Truck Co.	St. Louis	Mo.	360,000
Adams Truck Co.	St. Louis	Mo.	365,000
Adams Truck Co.	St. Louis	Mo.	370,000
Adams Truck Co.	St. Louis	Mo.	375,000
Adams Truck Co.	St. Louis	Mo.	380,000
Adams Truck Co.	St. Louis	Mo.	385,000
Adams Truck Co.	St. Louis	Mo.	390,000
Adams Truck Co.	St. Louis	Mo.	395,000
Adams Truck Co.	St. Louis	Mo.	400,000
Adams Truck Co.	St. Louis	Mo.	405,000
Adams Truck Co.	St. Louis	Mo.	410,000
Adams Truck Co.	St. Louis	Mo.	415,000
Adams Truck Co.	St. Louis	Mo.	420,000
Adams Truck Co.	St. Louis	Mo.	425,000
Adams Truck Co.	St. Louis	Mo.	430,000
Adams Truck Co.	St. Louis	Mo.	435,000
Adams Truck Co.	St. Louis	Mo.	440,000
Adams Truck Co.	St. Louis	Mo.	445,000
Adams Truck Co.	St. Louis	Mo.	450,000
Adams Truck Co.	St. Louis	Mo.	455,000
Adams Truck Co.	St. Louis	Mo.	460,000
Adams Truck Co.	St. Louis	Mo.	465,000
Adams Truck Co.	St. Louis	Mo.	470,000
Adams Truck Co.	St. Louis	Mo.	475,000
Adams Truck Co.	St. Louis	Mo.	480,000
Adams Truck Co.	St. Louis	Mo.	485,000
Adams Truck Co.	St. Louis	Mo.	490,000
Adams Truck Co.	St. Louis	Mo.	495,000
Adams Truck Co.	St. Louis	Mo.	500,000
Adams Truck Co.	St. Louis	Mo.	505,000
Adams Truck Co.	St. Louis	Mo.	510,000
Adams Truck Co.	St. Louis	Mo.	515,000
Adams Truck Co.	St. Louis	Mo.	520,000
Adams Truck Co.	St. Louis	Mo.	525,000
Adams Truck Co.	St. Louis	Mo.	530,000
Adams Truck Co.	St. Louis	Mo.	535,000
Adams Truck Co.	St. Louis	Mo.	540,000
Adams Truck Co.	St. Louis	Mo.	545,000
Adams Truck Co.	St. Louis	Mo.	550,000
Adams Truck Co.	St. Louis	Mo.	555,000
Adams Truck Co.	St. Louis	Mo.	560,000
Adams Truck Co.	St. Louis	Mo.	565,000
Adams Truck Co.	St. Louis	Mo.	570,000
Adams Truck Co.	St. Louis	Mo.	575,000
Adams Truck Co.	St. Louis	Mo.	580,000
Adams Truck Co.	St. Louis	Mo.	585,000
Adams Truck Co.	St. Louis	Mo.	590,000
Adams Truck Co.	St. Louis	Mo.	595,000
Adams Truck Co.	St. Louis	Mo.	600,000
Adams Truck Co.	St. Louis	Mo.	605,000
Ad			

MOTOR AGE

Adapting a Master Sheet to Estimate Basis

Some of the Advantages:

Service Can Be Placed on Cash Basis Simply and Easily
Complaints from Service Customers Can Be Anticipated
Corrects Errors Before They Mature, Saving Arguments

THE master sheet service system is not a theoretical experiment. The Larson-Oldsmobile Co., Philadelphia, Pa., has demonstrated its possibilities. It is backed up by years of service experience. Its structure readily permits it to be adapted to repair estimates.

Repair estimates offer many advantages. They enable one to place a service business on a cash basis in the simplest manner possible. They anticipate complaints. They save arguments and customers. Errors are corrected before they mature.

Favored by Service Managers

Many service managers favor repair estimates and would use this method of conducting their business if they had a sound basis to start on, consistent with a fair degree of simplicity. In the past repair estimate systems have been too complicated and could be used successfully only in very large institutions. This system is simple and can readily be adapted to any size of garage, as the number of forms required to operate it are not excessive.

The repair estimate system increases repair production. The estimates can be adjusted so that the time required to do a certain job will furnish a shooting mark for the repairshop. This will result in having the time required to do a certain job reduced and thus increase the capacity of a shop and at the same time furnish work to the customer at a cost less than has been possible under the

By Harlan C. Skinner

Motor Age Editorial Staff

old system of billing a job in accordance with the time and material required.

The division of repair operation as exemplified by the master sheet makes it comparatively easy to assign a definite charge to each of the operations. It furnishes a sound basis for a beginning.

WHYS OF THE MASTER SHEET WHICH APPEARED IN THE JULY 10 AND 17 ISSUES OF MOTOR AGE

1—Separation of a car into eight units or grand divisions and their sub-divisions of the Master Sheet detail the possible repair operations.

2—Its proper use insures the right repair and prevents errors.

3—By elimination of unnecessary writing it saves time and simplifies the office work.

4—It gives a complete cast and work record with seven forms.

5—The division of work such as "insurance" and "policy" is clearly shown.

6—Separation of repair operations make it an ideal basis for a repair estimate system.

This fact alone is of extreme importance as in the past it has been the chief drawback to such a system. Now that the master sheet clearly has defined all these operations, it will be a comparatively easy matter to assign a definite charge to each of these operations based on the result of experience.

Time Study and Repairs

Some factories have done considerable time study work with reference to the time required to do certain operations, but these usually have been carried on under ideal conditions, hence they do not always apply to service concerns in the field. The reason for this is that the repairshop equipment and labor conditions vary a great deal with the different concerns in the field, thus causing a fluctuation in the time required to do these certain specific jobs. From this it will be seen that it will be almost necessary for each service concern to make a study of the conditions surrounding its individual case before it can arrive at any definite charge for certain jobs. However, general statistics such as have been issued by some factories will be of great value in assisting one to arrive at these values.

Factory statistics are valuable because they furnish a sound basis of comparison, and as they usually are carried out under ideal conditions they furnish an incentive for the distributor's or dealer's service department to work to.

However, time statistics for repair

work are not always available, hence one intending to install such a system will have to make a study of conditions and determine the time required for certain jobs. This best is carried out by selecting a competent man on the service floor, preferably the service superintendent, who is thoroughly familiar with all the shop conditions and the class of labor employed.

It would be best then to start and estimate without telling the customer that you are doing so and make a trial of this system for three months. At the end of that time, based on the experience, one should be able to arrive at a definite charge for each of the items listed in the master sheet.

Of course, during the experimental period it will be absolutely necessary that the various department heads have conferences to adjust their differences and to check up each one of the customer's invoices against the original estimate and find out where the variations

are and make every effort to correct them.

It will be found that there will be estimates which will be too high and too low. But this is exactly the conditions that are needed to arrive at a suitable charge for certain work. Conditions such as these will necessitate a thorough examination of the order covering the job in which the estimate has gone wrong. In these investigations a great many things will be found out about the repairshop and method of doing work which were not known before. In fact the system is not notable because it furnishes an incentive for attempting methods to cut down the time required to do repair work.

Estimates May Err

Through the analysis of these various orders the service department soon will be able to arrive at a definite charge for each of these jobs. In estimates which are too high it may be found that some

one in the repairshop is loafing on the job or else the service superintendent did not make a thorough examination of the car before giving an estimate on it. All these little things which are helpful toward perfecting the system will be brought out. At the end of three months' trial of this system the service department should possess sufficient data and it should be accurate enough so that they could put the system into actual practice and have it work without loss to the department.

Under the division "Motor" of the master sheet if we were to do repair operations 1, 6, 7 and 8, that is, adjust connecting rod and main shaft bearings, examine piston rings, renew as needed, examine piston pins, renew as needed, and examine cylinder walls and pistons for scores and wear, it would require about 75 hr. of labor on a high-grade six-cylinder car with a seven-bearing crankshaft.

On a medium-priced six-cylinder car

The Master Sheet

MOTOR

- 1—Adjust connecting rod and main shaft bearings—renew as needed
- 2—True up stems, turn valves, ream seats and grind
- 3—Clean crankcase and put in fresh oil
- 4—Adjust timing gears, bearings, bushings and shafts
- 5—Adjust camshaft bearings
- 6—Examine piston rings—renew as needed
- 7—Examine piston pins—renew as needed
- 8—Examine cylinder walls and pistons for scores and wear
- 9—Micrometer pistons and cylinders for clearance
- 10—Repair or renew pistons as needed
- 11—Repair water pump
- 12—Repair oil pump
- 13—*a*—Examine and repair cylinder head, intake and exhaust gaskets
b—Examine crankcase, valve cover and oil pump gaskets
c—Examine all water inlet and outlet gaskets
- 14—Examine all water hose
- 15—Adjust spark and throttle control
- 16—Adjust or repair oil pressure or sight feed
- 17—Clean outside of engine and paint
- 18—Tighten or renew fan belt
- 19—Adjust valve lifts
- 20—Clean carbon
- 21—Adjust carbureter

ELECTRICAL SYSTEM

- 1—Clean and adjust spark plugs
- 2—Clean distributor—true up in lathe
- 3—Clean and adjust breaker points—renew if needed
- 4—Clean generator and true armature—renew brushes as needed
- 5—Clean starting motor—true armature—renew brushes as needed
- 6—Clean and adjust horn
- 7—Repair or adjust starting motor
- 8—Test storage—fill with distilled water
- 9—Clean and tighten all binding posts and wire terminals
- 10—Focus headlamps—Clean reflectors
- 11—Install bulbs as needed
- 12—Adjust or repair generator to charge correctly
- 13—Install new wiring as needed

TRANSMISSION AND CLUTCH

- 1—Examine clutch leather—Clean and soften as needed
- 2—Lubricate clutch shaft, clutch control levers and clutch collar
- 3—Adjust clutch pedal
- 4—Tighten transmission on gearshift lever
- 5—Renew oil in transmission
- 6—Renew transmission felt washers as needed
- 7—Remedy slipping clutch
- 8—Remedy grabbing clutch

UNIVERSALS

- 1—Renew pins, bushings, yokes, etc.
- 2—Lubricate pins and bushings with heavy oil
- 3—Pack universals with grease
- 4—See that distributor cover is set tight and permanently
- 5—See that universal joint flange bolts are tight and wired
- 6—See that grease plugs are tight

DIFFERENTIAL

- 1—Examine adjustment of differential gears
- 2—See that all differential and pinion bearings are in perfect condition and adjusted properly

- 3—Renew oil in differential
- 4—Lubricate pinion shaft bearings
- 5—Take lost motion out of axleshaft
- 6—Remedy grease leak from rear wheels
- 7—Repair differential

STEERING GEAR

- 1—Adjust steering gear and lubricate
- 2—Adjust and lubricate steering reach and cross rods
- 3—Grease and tighten steering king bolts
- 4—Renew steering king bolts or bushings

CHASSIS

- 1—Examine all wheel bearings—grease and adjust properly
- 2—Line up front wheels
- 3—Grease and tighten all shackle bolts—renew any worn shackles and bolts
- 4—Tighten all spring clips
- 5—Lubricate all brake linkage—remedy any lost motion in clevis pins and rod bushings
- 6—Tighten body bolts
- 7—Tighten engine and bed bolts
- 8—Tighten fender and running board bolts
- 9—Adjust body doors and locks
- 10—Tighten muffler and renew if needed
- 11—Clean gasoline tank and tighten brackets
- 12—Repair gasoline tank
- 13—Repair gasoline gage
- 14—Examine gasoline line and connections
- 15—Clean rust from tire rims and paint with graphite and water mixed
- 16—Adjust and tighten tire rack
- 17—Repair tire rack—renew if needed
- 18—Tighten running board boxes, engine pans, fenders, etc.
- 19—Reline foot brakes
- 20—Reline emergency brakes
- 21—Straighten fender
- 22—Install new fenders
- 23—Repair radiator
- 24—Tighten rim bolts
- 25—Repair springs—renew if needed
- 26—Adjust brakes or repair
- 27—Straighten axles
- 28—Install new gas tank
- 29—Install new or repair emergency brake latch rod

MISCELLANEOUS

- 1—Clean vacuum tank and repair
- 2—Repair carbureter
- 3—Repair top and curtains
- 4—New light in rear curtain
- 5—New top boot
- 6—Repair upholstery
- 7—Renew or replace tonneau carpet
- 8—Recover runningboards
- 9—Recover toe boards
- 10—Repair, tighten and adjust windshield
- 11—New glass in windshield or sedan door
- 12—Repaint car
- 13—Renickel all metal parts
- 14—Testing
- 15—Delivering and teaching—shifting company cars
- 16—Demonstrating
- 17—To freight yards for new cars, checking, greasing, testing, etc.
- 18—Errands
- 19—Dress upholstery and top
- 20—Free up and adjust spark and throttle control housing

The new Malbohm plant with a capacity of fifty cars daily is nearly completed, and occupancy is promised in August. The present manufacturing schedule is forty cars a week.

General Price Increase Probable

Motor Vehicles Expected to Reach War Cost Peak
August 1—Parts Getting Higher

DETROIT, July 26—A general increase in prices that will put the market for automotive vehicles of all kinds practically on the same basis as it was when the war stringency was at its peak is almost certain to take effect Aug. 1. Already some seven or eight of the car makers have added from \$90 to \$200 to their lists. Truck manufacturers must follow suit, according to the best informed opinion in Detroit.

As yet no appreciable increase in truck prices has been made but it is inevitable when certain circumstances are taken into consideration. Last week one of the largest of the axle manufacturers notified its customers that it would make a 10 per cent increase on car axles at once and a 5 per cent increase on truck axles. Other parts are soaring in price. Such a small part as a hood clamp, which is a piece of metal about 6 in. long with little or no milling required to produce it, once cost 18 cents. Now it brings 42 cents.

The position of the steel market is still uncertain although improving rapidly. Steel prices, however, are going up instead of down as many companies hoped. While the increase is slight, it has been sufficient to bring many concerns into the market who were holding out for a further price drop. Labor costs are higher in Detroit to-day than during the year.

The demand for cars continues without abatement. Factory output is limited in spite of every effort to reach capacity production. The demand is apparently greater for \$2,000 cars than it is for those from \$700 to \$800. Limitation of production, particularly on the production of closed cars, is due to scarcity of bodies and high price of body material.

There is a growing export demand. With real peace only a few weeks old and all war embargoes still in effect, foreign representatives are crowding into the market and besieging the Detroit factories for a share of the cars, production of which is falling far short of meeting demand of the American public.

CADILLAC BRANCH FOR CHICAGO

Chicago, July 25—A direct factory branch for the distribution of Cadillac cars in the Chicago territory will be established Aug. 1, when the Cadillac Motor Car Co. takes over the business of C. H. Foster, which for many years has been operated under the name of the Cadillac Automobile Co. of Illinois. Sales and service headquarters remain at the same location. C. R. Cunliffe, who has been in charge of the Cadillac business in Philadelphia, has been appointed general manager of the new Chicago branch.

Mr. Cunliffe has been associated with

the Cadillac for eight years, and during the last four he was sales manager for the Automobile Sales Corp., Cadillac distributor in the Philadelphia territory. Before joining the Cadillac organization Mr. Cunliffe served both as branch manager and assistant general superintendent of branches for Armour & Co. in the Philadelphia district.

Mr. Foster has made no announcement of his future plans.

The purchase of Mr. Foster's interests by the factory ends a sixteen year's connection on the part of Mr. Foster with the Cadillac company. He started as the Cadillac dealer in Chicago sixteen years ago with a force of four persons. His establishment now numbers 350, and it is a model of a modern merchandising and service business. To increase his service he established a body building plant which drew patronage in high-grade bodies from all over the United States.

STEPHENS ANNOUNCES NEW PRICES

Moline, Ill., July 26—Announcement of an increase in production and a new schedule of prices was made at the meeting of the Stephens distributors in Freeport. The company will build at least 12,000 cars during the next twelve months. The new price schedule is substantially an increase of \$200 on each model, but the new prices include Fisk cord tires with non-skid on the rear. Heretofore the cord tires have been extra. The prices are:

Two-passenger	\$1,975
Four-passenger	1,975
Six-passenger	2,050

HAYNES TO COST MORE

Kokomo, Ind., July 26—The Haynes Automobile Co. has increased the price of its 1920 models \$200, effective July 31. Cord tires have been made standard equipment. The new prices are:

LIGHT SIX	
7-pass. touring.....	\$2,685
4-pass. roadster.....	2,685
4-pass. coupe.....	3,300
7-pass. sedan.....	3,550
7-pass. limousine.....	4,200

LIGHT TWELVE	
7-pass. touring.....	\$3,450
4-pass. roadster.....	3,450
4-pass. coupe.....	4,000
7-pass. sedan.....	4,200

GARAGES MUST KEEP RECORDS OF CARS LEFT WITH THEM

Philadelphia, Pa., July 24—Proprietors of public garages throughout Pennsylvania have had their attention called by letter to the provisions of the bill approved by Governor Sproul requiring that records must be kept of all cars stored or left for repairs in every garage in the state. The provisions of this act are now in force. A special form has

been prepared by the State Highway Department, and this must be used by garages. Records must be kept in ink or indelible pencil and shall be open to inspection of police or other authorities for one year from date. A stiff fine is provided for failure to maintain the record.

Police authorities declare that the keeping of these records will do much to end the stealing of cars. The record sheet contains spaces wherein a complete description of the car is kept—the make of the machine, manufacturer's number, make of engine and other information.

PHILADELPHIA SALES UNPRECEDENTED

Philadelphia, Pa., July 26—Despite a week and a half of almost continuous rain, which probably prevented many "stop-in" sales, a canvass of dealers along the row shows conclusively that sales of cars for June and July have been almost unprecedented. Several showrooms which are accustomed to have an imposing display of models have been swept clean of every sample car. In fact, sample cars only will comprise the next shipment of more than one factory to Philadelphia, and even these are being promised with reservations. Most dealers are sold at least thirty days in advance and some two and three months. One dealer said that he had no more cars to sell and the next cars, which would not arrive until the middle or last part of August, would be samples only.

Service stations are being overworked and garages generally are jammed full nightly. There has been a building impetus in this line and options are being taken up by some dealers on property to extend service and garage accommodations.

PACKARD RAISES PRICES

Detroit, July 29—Packard has increased the price on all car models approximately \$400 and on all trucks \$200. The new prices take immediate effect.

MARMON LAUNCHES EXPANSION

Indianapolis, Ind., July 25—With the letting of contracts this week for two new factory buildings the Nordyke & Marmon Co. begins its program of expansion and at the same time announces it will issue \$2,500,000 worth of long-term securities. A five-story building, 80 by 600 ft., is to be completed late this fall and will be used for the manufacture of motor car bodies. Another building, one story and 100 by 800 ft., will be used as a final assembly plant for Marmon cars. In the plans for expansion of the plant are included a new planing mill, a dry kiln

and a powerplant. With the completion of the new construction buildings Nordyke & Marmon will have a factory covering 45 acres.

In an interview given out by Walter C. Marmon, president, it was stated that the expansion is due to the increased facilities and plant the company had to take over from the Government after the completion of the Liberty engine contract. The enlarged plant necessitated by the contract left the company with large machine shop facilities which greatly exceeded its body and woodworking space and facilities, so the new buildings were planned.

The extensions are expected to enable Nordyke & Marmon to at least double present production of cars and milling machinery.

UNIONTOWN RACE SEPT. 1

New York, July 28—A 225-mile race, with a purse of \$14,000, was approved today by the A. A. A. Contest Board for the Uniontown, Pa., meeting scheduled for Labor Day, Sept. 1. It also was announced that the sweepstakes set originally for Sept. 20 at Sheepshead Bay and advanced to Sept. 13, might be put back to the later date to permit a revival of racing in northern New York at the state fair at Syracuse on the 13th.

In an exhibition contest at Sheepshead Bay last Saturday, Tom Milton in a Duesenberg defeated Dave Lewis in a Meteor, who was second, and Gaston Chevrolet in a Frontenac, third, over the 10-mile course. Milton's time, unofficially, was 5 min. 18¾ sec., which would have set a new American record had it been made in an A. A. A. match.

I. H. C. TRACTOR OUTPUT UNAFFECTED

Chicago, July 25—The strike at the International Harvester works in Chicago has not affected production of tractors. The main tractor plant is located at Milwaukee, and that plant has been able to take care of the production lost by the strike at the smaller tractor plant in this city.

SEPARATE BUILDING FOR TRUCKS

New York, July 28—Show officials of the National Automobile Chamber of Commerce are looking for a building to house trucks separately from cars and accessories in the national show here early in January. The main show will be in the Grand Central Palace, and early indications point to a large array of exhibits.

35,000,000 CHAMPIONS IN 1919

Toledo, Ohio, July 28—The Champion Spark Plug Co. has outlined a production program for 1919 which is intended to surpass all previous records. It calls for the manufacture of 35,000,000 spark plugs, 10,000,000 more than in 1917, and 11,000,000 more than in 1918. To provide for this output the company has enlarged its present factory buildings and added to its factory equipment. Plans for further additions are now under way.

Million Fords This Year

Double the Production of Last Twelve Months Announced to Branch Managers

Starters on All Models as Soon as Output Permits

DETROIT, July 28—Ford branch managers, in convention at the Ford Motor Co. plant since July 18, ended their meeting to-day. Forty-three managers were present, thirty-five representing United States branches and eight from Canada. The big problem coming before the meeting was the drafting of plans for merchandising the 1,000,000 cars the Ford company proposes to build during the coming year.

The current fiscal year of the Ford Motor Co. ends July 31. The manufacturing efforts of the company for the first six months of this year were concentrated entirely on the output of war materials and it was not until March, 1919, that the production of Ford cars and parts began to assume normal proportions. At present production is averaging 3000 cars daily, and production for the year ending July 31 will be more than 500,000 cars. The company was never so far behind in orders. There are at present 143,751 unfilled orders on its books.

The managers have been informed that as soon as starter production equals car production all machines will be equipped with electric starters. At present, however, the company is only able to secure enough starters for its sedans and coupes. The starter is being made at the Ford plant in a special department. It also was explained that some Ford cars have been equipped with demountable rims because the company found it impossible to secure a sufficient number of standard Ford rims. In order not to hold up regular daily production, it was necessary to use the demountable rims when the supply of standard rims became exhausted. The situation is rapidly righting itself. The demountable rim will not be made a part of the standard Ford equipment.

ENGLAND TO IMPORT 5000 U. S. CARS

London, England, July 26—Special cable—The government has granted permission for the immediate importing of 5000 cars or chassis. These are to be divided among importers in ratio of their total imports during the years of 1912 to 1915 inclusive. It will be necessary for these importers to make declarations as to their importations before the allotment of the 5000 will be made.

This unexpected permitting of 5000 cars undoubtedly has been brought about by the greatly increased demands for machines and the failure of British companies to get into production as was expected. Most of the factories are victims of what is known as the slow strike, due to the workers not speeding up. One large manufacturer declares that its out-

put per man is less than half of what it was before the war and less than a third of what it was during the war. In other factories there is similar reduction in pace.

No indication as to what the government expects to do Sept. 1 when the period of rationing motor car imports expires is given in the admission of the present 5000. The government has promised a statement of definite policy before parliament rises Aug. 15.

The importation of motor truck chassis of useful load not exceeding 3,360 lb. is permitted on an unrestricted basis. This action undoubtedly is due to the very great demand for light-capacity trucks of which there is a dearth in the British Isles at present.

MORE CAPITAL FOR FIRESTONE

Akron, Ohio, July 25—Stockholders of the Firestone Tire & Rubber Co. Thursday were asked to vote on an increase in capitalization from \$15,000,000 to \$75,000,000, of which two-thirds is to be preferred and one-third common stock. Ten million in preferred will be sold at once to enlarge the plant, officials state.

PENNSYLVANIA TIRES LOWER

Jeannette, Pa., July 25—The Pennsylvania Rubber Co. has reduced tire prices, effective July 19. The price on the 34 by 4 vacuum cup fabric casing is \$32.90, a reduction of 10 per cent, and \$48.80 on the cord casing, a reduction of 5 per cent. The adjustment basis is 6000 miles on the vacuum cup fabric tires and 9000 on the cords.

TO MAKE DOBLE IN CHICAGO

Detroit, July 28—Doble steam cars will be made by the Amalgamated Machinery Corp., Chicago. This concern now has the exclusive manufacturing rights to manufacture the Doble in this country, and eventually the Doble-Detroit Steam Motors Co. will be merged with it. For the time being this concern will be maintained intact to deal in Doble patents and foreign manufacturing rights.

Manufacture of Doble cars in Chicago will be under way in a few months. No additional stock will be issued. The Doble company, which was incorporated for \$10,000,000, has issued \$2,000,000 to the public and the remaining \$8,000,000 is turned over by the terms of the purchase to the Amalgamated Machinery Corp. The officers of the Doble company, Morgan J. Hammers, president, and A. B. Frenier, patent attorney, become officers of the Amalgamated Machinery Corp.

Abner Doble, who is employed by the Doble-Detroit company, is in France supervising the manufacture of Doble cars in that country. It is stated that a company is being organized in Great Britain to start manufacture there.

The Amalgamated Machinery Corp. has been manufacturing turret lathes and other heavy munition machinery for the last three years. In addition to the Doble car, powerplants, heating furnaces and other steam apparatus will be manufactured.



EDITORIAL



Ohio Competitive Test Features

IT IS a sad commentary on the farsightedness of the management of the national tractor demonstrations that some of the local demonstrations this season will far surpass the Wichita fizzle in the matter of interest to the public generally and real information for the manufacturers, the trade and the farmer. Ohio has four state demonstrations scheduled, in four different cities, each two days in duration and each following the same general lines.

SUCH real information features as drawbar tests on every tractor entered in the demonstration and the forbidding of plow experts to accompany the tractor except for the first two rounds will make the demonstration more valuable than any national demonstration ever has been. Judging from the reports of the first day at Columbus, which is published

on other pages, the competitive features are not detracting from the general interest of the event. On the contrary, the attendance at this local affair rivals that of the national demonstration at Wichita two weeks ago. It is certain that the total attendance of the eight days in Ohio will completely eclipse that of the Wichita affair.

ONE of the things which gives the Ohio demonstration the standing that the national demonstrations never have is the fact that it is under the supervision of the Department of Agricultural Engineering of the Ohio State University with the co-operation of the department of agriculture and the county farm bureaus. It is only when such tests are under the direct control of independent bodies that their findings can be taken without taint of bias.

Increase in Car Prices

WITH the price of finished products in other manufacturing industries increasing from 50 to 100 per cent, the motor car industry is making a very creditable showing for itself. An analysis of the price fluctuations of forty-nine representative American makes of cars reveals some astounding facts. From January 1 to July 24 of this year the average increase in price over this number of makes was 7.6 per cent.

SOME may attempt to disapprove this statement by saying that cars were over-priced Jan. 1. But this is not true, for financial statements show that the profits of these companies are not in excess of others engaged in different industries when compared on a percentage basis.

NOR has any of these companies had any advantage in the steel market, as government restrictions placed all on practically the same basis. The price of raw materials does not influence the price fluctuations in these instances to a great extent.

THESE are the days when the superior manufacturing methods of the industry demonstrate their intrinsic value. This is probably the real explanation of the ability of motor car manufacturers to meet the present situation without creating exorbitant prices for their vehicles. Truly it is a real credit to American automotive manufacturing and assembly methods.

Speed Good Roads!

ONE of the biggest lessons in good roads is being staged these days. It is not a lesson such as one might have to learn in time of war, when the existence of one road in such a state that a constant stream of trucks could be supported by it saved Verdun. But it is a lesson just as important, for unless it is learned and learned well progress will be lamed.

IF THE transcontinental Army truck train results in half as much highway action as it has in highway enthusiasm along its route so far, this lesson will be well on the way to being learned. In one week bad roads stretched a mileage schedule 20 miles. Why? Because detours had to be made and the trucks had to travel 104 miles instead of 84 to get to their objective point. This is one example. While accidents have been very infrequent the eighteen days of journeying across country, the delay and trouble due to bad roads has been constant. Equipped to be self-sustaining, the Army truck train has persisted in a way that gives much credit to its personnel and equipment. Nevertheless a glance at the truck train's log, even as quoted from in this issue, shows that it too has found rough sailing.

THE majority of the roads covered during the last week really do not deserve the honor of leading the trucks onward on the first transcontinental journey of the kind. They might have done very well for the prairie schooners of pioneer days, but the twentieth century is a far cry from the day of the prairie schooner. Yet the roads covered during the last week are situated in a section of the country well able to remedy matters. That Iowa realizes its need might be deduced from the continuous road meetings which have kept up with the advance of the truck train across its width. Iowa is not alone in its need of better roads, however, If it were, there would be little to worry about.

WHILE the reports of the roads found thus far by the truck train are not of the best there is some hope in the reception along the way. The general attitude of the public along the route has been one of interest in the train and in the various types of vehicles included. The greatest appeal also has been found to be in the War Department's encouragement of the good roads movement. The response to that appeal should take concrete form in greater highway activity from now on.

Ohio Tests Example of What Tractor Demonstration Should Be

COLUMBUS, Ohio, July 28—Special telegram—Following virtually on the heels of the Wichita demonstration, which after the smoke had cleared netted no figures or data of any kind, the first day of the Ohio tractor demonstration foreshadowed exactly the kind of tractor tests that in the future must be put on if we expect to obtain useful comparative figures that really tell a story.

Today's demonstration was a genuine intermingling of farmers, tractor dealers, factory men and the men whose job it is to keep the machines maintained, namely, the oilmen. The affair was not gigantic. It was small enough so that a potential buyer could watch all the machines during the day.

Farmer Could Run Tractor

About four tractors plowed, and there were private demonstrations also. The farmer had opportunity to operate a machine himself. He could ask all the questions he wanted. Engineers from the lubricating oil companies mixed with the crowd and told of the oil requirements on tractors. Many times owners of tractors, dealers and engineers got together on various problems.

In short, demonstrations like to-day's are like a great melting pot where tractor problems and subjects can be thoroughly threshed out. The 500 or more persons at the demonstration learned more about tractors than the whole crowd at Wichita all five days.

There is no racing, the first requisite being a good job of plowing. During the time for private demonstrations the makers or dealers can show the tractors any way they like. This gives the farmers who want to see some particular machine in more detail and in the per-

formance of numerous operations a better chance to do so.

One of the best features of the Ohio demonstration is the drawbar test by the Gulley dynamometer, which shows the pull of the tractor through a considerable distance. By appropriate apparatus also the fuel consumption is accurately obtained. Only a few machines were tested

BIG FEATURES IN OHIO DEMONSTRATION

Conducted by the Department of Agricultural Engineering, Ohio State University. Dynamometer Tests as well as Plowing Demonstrations.

Observer on Each Tractor Twenty-Eight Entries

The dates are

Columbus, July 28-29.

Middletown, Aug. 1-2.

Fostoria, Aug. 6-7.

Akron, Aug. 12-13.

in this way to-day, but the Department of Agricultural Engineering of Ohio State University expects to have figures on all the machines entered at the conclusion of the Akron tests Aug. 12-13. The tractors also will be given a maximum load to determine the maximum pull.

The whole equipment for these demonstrations will be carried on a train of flat cars to Middletown, Fostoria and

Akron for the other tests. This insures a complete outfit for the entire series. New conditions will be met in the other tests, and more will be accomplished by spreading the test over a wider area.

The exhibitors at Wichita well might take a lesson from this and instead of wasting thousands of dollars on a demonstration that profits them nothing put on many smaller tests over the country like to-day's.

There were not so many tractors in the field at one time. Each machine has a proportionately larger plot to plow, and this gives the farmer the opportunity to watch it over a long period. In the big demonstrations where sometimes four machines of the same make but different capacities are used, the plowing is over in a few minutes before the farmer can find the machines he wants to observe. We are as yet only in the elementary grades so far as the use of tractors is concerned, and it will take decades to change our farmers and farm management over to the economical use of tractors, but the feeling here is general that small demonstrations and many of them put on by dealers or institutions like Ohio university is going to lessen the educational work every year, as regards power farming.

Figures on Test in August

Full figures on the dynamometer tests will not be available until after the tests at Akron Aug. 12-13. There were several new tractors here to-day—the Shelby, made by the Shelby Tractor and Truck Co., Shelby, Ohio; the Bruce, made by T. W. Bruce, Summerfield, Ohio; the Reliable, a garden tractor. To-day's and tomorrow's tests are at the Johnson farm six miles west of the city.

Big Features in Ohio Demonstration Rules

1—Only one tractor of each size or model of the same make may be entered.

2—Exhibitors must enter the same tractor in all four demonstrations, same to be transported from place to place by special train.

3—No substitution of tractors can be made. If a breakdown occurs, the tractor must be repaired in the field and later be removed under its own power.

4—Each tractor exhibited must be supplied with a double placard not over 20 by 30 in. in size (if smaller, to be of similar proportions) which shall give the following information:

- Name and address of exhibitor
- Name and rating of tractor
- Weight equipped for the field
- Fuel used in demonstration
- Number and size of bottoms pulled
- Price f. o. b. factory

Note—The Department of Agricultural Engineering will also make up similar uniform placards for placing at the heads of lands. The cost of these will be prorated among the companies entered.

11—All plows should be adjusted on the proving grounds

prior to each demonstration. In the demonstration plow experts will be permitted to make final adjustments on plows during the first two rounds only, thereafter only the operator may accompany the rig.

14—An observer will be assigned to each tractor for the purpose of checking the quality of work done. He will wear an official badge and will be responsible for the strict enforcement of the requirements as set forth in the rules.

16—No tractor will be permitted to plow faster than its advertised rated plowing speed.

18—All tractors entering demonstrations must submit the drawbar tests.

20—Points of conduct for the tests are approximately as follows:

a—The same plow pulled by the tractor in the demonstrations will be used in the drawbar tests.

b—After the dynamometer has been placed in position one round will be allowed for adjustments.

c—Drawbar tests on the new Gulley dynamometer will be made expressly for the Department of Agricultural Engineering.

d—The normal plowing test will be made during the second round.

Trucks Find Roads Nothing to Brag Of

Passage of Train Across Iowa Is Continuous Highway Meeting

DENNISON, Iowa, July 27—The transcontinental Army truck train reached here to-day on schedule time, eighteen days of travel out of Washington. The train has covered 1205 miles, the actual mileage being considerably greater than planned because of detours on account of bad roads. On the run from DeKalb, Ill., to Clinton, Ill., the scheduled distance of 84 miles was stretched to 104.

Since the train entered Iowa its progress has been an almost continual good roads meeting. The presence of the trucks has been taken advantage of by highway officials and road boosters to stage a continual demonstration through the state. Meetings have been held wherever the train stopped. The big event of the week was the celebration at Cedar Rapids. Lieutenant Governor E. R. Moore joined in extending an official welcome to the state, and everybody for miles around turned out to greet the transcontinental travelers.

Dust Causes Troubles

Most of the operating troubles of the week were concentrated in one day, Tuesday, on the run from DeKalb to Clinton, Ill. Ninety of the 104 miles traveled that day were over dirt roads in wretched condition and several inches of dust, which formed clouds that obscured vision, necessitating wide spacing and slow progress. In spite of the utmost precautions there were a few accidents.

A 3-ton truck rolled over an embankment and landed right side up, without damage to occupants or truck. A trailer carrying a heavy pontoon boat was stalled on a steep grade on a heavy sand road and had to be pulled over the hill by long cables. Just before reaching camp at Clinton five trucks were stalled on a sandy road. These were pulled out without much trouble. The only accident of consequence was to a

motorcycle which lost its bearing in the dust and was wrecked, injuring the driver slightly. Both driver and machine are expected to resume their places in the convoy in a few days, however. Two plank bridges collapsed after supporting part of the train. The bridges were repaired in less than an hour.

The official reports pay no compliment to the majority of the roads covered in the last week. From Fort Wayne to South Bend it was "stone and dirt roads poor to fair, dust causing considerable inconvenience, small mileage of good concrete and brick roads, very few grades"; from Chicago Heights to DeKalb, "dirt and stone roads in poor condition and small mileage of improved roads. The dust obscured vision at 20 yd. in some places." From Clinton to Cedar Rapids and then to Marshalltown, the going was much better, mostly over dirt roads which had been dragged recently and were in good condition but dusty.

No maintenance troubles of any consequence occurred during the week. Engine trouble developed on the run into Cedar Rapids due to rough traveling of the previous days, but this was corrected quickly.

\$10,000,000 FOR GOOD ROADS

Baton Rouge, La., July 25—Louisiana, assisted by the various parishes and Federal appropriations, will invest more than \$10,000,000 in improved highways in 1919. Contracts for approximately \$6,000,000 of this work already have been signed, and work is progressing on at least two-thirds of this sum. Several of the roads will be connecting links between the road systems of Arkansas, Texas and Mississippi with that of Louisiana, and the balance will be interior building and improvement.

According to P. M. Milner, president

of the Motor League of Louisiana, which has had a great deal to do in persuading the state and parish authorities to expend this large sum on the roads, the day of the gravel and shell road in the South is past, and vitrified brick or concrete must be used unless the people wish to be paying for their road bond issues long after the roads themselves have been worn out. Nearness of water to the surface of the soil in Louisiana, combined with constantly increasing use of the heavy trucks and tractors, necessitates better and more enduring road-building materials, so as to obviate such delays as met the Jefferson highway sociability runners, who had to hire ox-teams to pull their cars out of mudholes just outside this city, the capital of the state.

ROAD CONGRESS IN FEBRUARY

Louisville, Ky., July 25—The ninth American good roads congress under the auspices of the American Road Builders' association will be held in Louisville, the second week of February. The eleventh national good roads show will be held in connection with the convention.

\$1,000,000 FOR COUNTY'S ROADS

Ann Arbor, Mich., July 25—The county road commissioners have decided to carry out a plan for building trunk line roads at a cost of approximately \$1,000,000. This is the most ambitious road-building program ever attempted in this county and one which is believed to be without precedent in the state. About 50 miles of improved highway will be constructed, including a 16-mile stretch between the Jackson county line and this city on east and west trunk lines. This road will be of approved paving material and will link up with the Jackson system on one side and the already finished work in this county, leaving a continuous paved highway from Detroit to Jackson.

UPKEEP EXCEEDS COST OF SOME ROADS

Buffalo, N. Y., July 26—Interesting comparisons between the cost of maintenance of concrete and other type roads are afforded in a report just made public



Here is a general view of the picnic held by the Topeka trade. A special outing atmosphere is lent by the "law" that required

here by Highway Commissioner F. S. Greene.

The report shows that 81 miles of non-concrete roads built in 1912 have cost to maintain since that time \$702,872, while their original cost was \$955,872. In Wayne county a road 3.87 miles long built for \$26,515 cost \$37,062 to maintain.

During the last four years 208 first-class concrete roads in the state were maintained at a cost of \$138 a year, while during the same period the average maintenance upkeep cost of 2451 miles of waterlound macadam was \$911.

TOPEKA TRADE ENJOYS OUTING

Topeka, Kan., July 25—It took 156 cars to carry members of the Topeka Automotive Dealers, their families and friends, to the annual association picnic at Tecumseh last Thursday. Practically all the garages and repairshops in the city were closed for the occasion. A barbecue dinner was prepared, and it took two sheep, two hogs, 300 lb. of pork and 300 lb. of beef to satisfy the crowd, it is said. Every man was ordered to wear overalls, and those who failed to do so were "placed under arrest." George Evans of the Motor Service Co. pleaded in his case that he had on an old suit. Ben Wolf was "pinched" for smoking cigarets, it being charged that he was under age.

Several men were arrested for having their taillights unlit in broad daylight, and Eddie Wright, who they say lost all his spare change on Jess, started a game of African golf and the authorities made a grand pull there. Ted Lagerstrom, caught with the galloping dominoes, was forced to swear on a newly vulcanized inner tube not to touch them again for 24 hr.

Several members of the trade were pinched on general principles, and Harry Imes, Dodge dealer, was served with a subpoena to appear before the Tecumseh police court on the charge of needing a shave badly. Harry G. Moock, secretary and business manager of the N. A. D. A., informally discussed some of the benefits to the trade of the organizations and praised the spirit of co-operation between dealers, garage and accessory men as exemplified at the Topeka outing.

Louisiana to Link Every County Seat

Campaign for Network of Roads Will Be Launched This Fall

NEW ORLEANS, La., July 25—One of the main projects to be brought up at the second convention of the Louisiana-Mississippi Automobile Trades Association at Jackson, Miss., in September, will be a uniform campaign for improved highways linking every county seat in Louisiana, with trunk lines connecting the road systems of the two states. This association was formed in New Orleans July 10-11, when George D. Wray, of Shreveport, La., was elected president and C. U. McDowell, secretary and general manager.

The association now has more than 500 members in the two states, with new applications coming in. Headquarters have been opened in New Orleans, and organization of parish branches in Louisiana and county branches in Mississippi is well under way. The Motor League of Louisiana is working with the dealers' association in promoting road improvement, and about \$20,000 will be expended this year in a campaign to arouse enthusiasm and action for good roads in the two states.

Further objects of the association, which is the first of its kind ever formed in Louisiana or Mississippi, are the improvement of distribution and sales systems on cars, trucks and tractors; development of service for the owner, more demonstrations and exhibitions of tractors, especially in Mississippi, where there is a large and undeveloped field for this kind of farm machinery, and closer co-operation, rather than competition, between the dealers in both states. Four vice-presidents have charge, respectively, of the car, truck, tractor and equipment divisions. Promotion of good road building, however, is one of the main objectives, to which much of the early energy of the organization will be devoted. Dues have been placed at \$25, \$50 and \$100 a year, depending on the number of automotive units handled by the dealer applying for membership.

Funds so raised are to be used in general development of the objectives of the association.

TRUCK PARADE FOR IOWA FAIR

Des Moines, Iowa, July 26—Iowa is to have a big motor transport and good roads day at the state fair this year. The state fair board is co-operating with the truck dealers of Des Moines to make the affair a success and has named Aug. 29 for the event. This is the same day of the motor car races and it promises to be a big motor day.

The Des Moines Motor Truck Association is taking the lead in promoting the event and has named a committee to engineer the day. A publicity campaign is now under way to interest all the truck dealers in central and southern Iowa in the affair. It is proposed to have between 300 and 500 trucks in a big parade which will form outside the fairgrounds and make the complete tour of the grounds and then circle the race track in front of the amphitheater.

BAILEY TO DIRECT HINKLEY SALES

Detroit, July 28—George G. Bailey has resigned as sales manager of the Brown-Lipe Co. of Syracuse, N. Y., to become director of sales for the Hinkley Motors Corp., effective Aug. 1.

BELLENGERS TO STUDY U. S. METHODS

Detroit, July 25—The Bellenger brothers, Paris, France, members of the firm of Bellenger Freres, have reached America with their chief engineer, John Faure, and will spend some time studying American motor car manufacturing methods. In Detroit they will be the guests of Briscoe & Stahl. This firm for many months has been designing a car to be manufactured in France by Ballinger Freres.



members to wear overalls. Those who thought to get out of the ruling by wearing old suits found themselves "arrested"

Demand Exhausts Agency Allotments

Detroit Unable to Get Territory for Some Cars—Old Distributors Taking Output

DETROIT, July 25—The motor car sales business, which is booming as it never boomed before, is attracting many in Detroit, and if agencies were available, the present year would see numerous new firms start business. This may be said to apply to every other city in the country for the demand for cars in all sections is greater now than at any time in the history of the industry. But agencies are not available these days. Except in cases where new companies are placing their products on the market, no new agencies are going to open up in Detroit.

There are many important cars which are not represented in the Detroit district such as the Nash, Auburn, Kissel, McFarlan and others. These companies all have turned down opportunities to place their products in Detroit and Michigan. The reason is very simple. Why should a company open new agencies, they argue, when they cannot meet the demand of their existing sales organization.

Cannot Get Agencies

During the last two weeks, a prominent Detroit business man with an established reputation in motor circles has been endeavoring to secure the Michigan distribution for four or five cars not represented in this section. He is willing to invest a small fortune in a sales and service station, but when he went to the companies with his request for their products, he was met with a flat, but courteous refusal. The companies told him they could not think of considering his proposition until they had caught up with orders already on file. Inasmuch as nearly every company in the business is selling cars faster than it can produce them, there is no telling when production will balance sales.

One of the companies was optimistic enough to promise to consider his request in about six months. The others could promise nothing. So the gentleman in question has been obliged to defer his entrance into the trade.

The companies are finding themselves not up against the proposition of selling their products, but turning away sales without creating hard feelings, and without showing partiality. This, in many cases, has become a very ticklish and diplomatic problem.

About two months ago John R. Lee and C. Harold Wills, two former officials of the Ford Motor Co., withdrew from that firm and announced their intentions of manufacturing a modern-priced car. Since their announcement was first made public they have received more than 1,000 applications for agencies. These letters have come from every section of the United States and Canada. Inasmuch as Mr. Wills and Mr. Lee are just preparing

to erect their plant, they have paid no attention to the organization of a distributors' and dealers' body and probably will not be ready to take up this work for several months to come.

Unable to secure agencies, many men are going into the used car business. The demand for used cars in Detroit is almost as great as the demand for new models. Used cars are bringing higher prices than ever before. After being repainted, repaired and retired, many of these cars are selling for more than originally was paid for them when new. According to Detroit dealers, the buying boom shows no indication of letting up.

Factories have been doing everything possible to catch up with production, but in many cases the big plants have been badly handicapped by a shortage of materials and parts, due to labor troubles in the plants of the parts makers. Hudson, Essex, Buick, Cadillac, Oldsmobile, Chevrolet, Studebaker, Dodge, Ford, Hupmobile, Chalmers, Mawell, Paige, Chandler and other Detroit distributors are not promising deliveries before Sept. 1. The Buick distributor reports a demand way beyond production. The factory cannot catch up anyway near with the request from dealers and distributors. If 1,000 Buick cars could be received in Detroit today, the local branch would have a place for all of them. Could the Detroit Oldsmobile distributor have received the cars, he could have sold 1,000 machines more than he has already sold in the last three months.

The Chalmers distributor is behind over 200 orders at present and is selling cars faster than he can receive them from the factory. The Cadillac sales branch is experiencing the best business in its history. If this company were to turn out 30,000 cars instead of 20,000, the extra 10,000 would be snapped up by the dealers almost immediately.

The Hudson and Essex distributor here has even sold his demonstrating cars. At the Hudson plant it is reported that scores of agents have contracted for their entire year's allotment. The Ford Motor Co. is behind over 143,000 orders.

These are but typical examples of a situation which faces all of the Detroit manufacturers.

PACKARD PREPARES FOR FOREIGN TRADE

New York, July 28—Anticipating its ability within a few months to meet not only domestic but foreign demands for cars and trucks, the Packard Motor Car Co. has made plans to export 8000 motor vehicles in 1920—30 per cent of its estimated total production. Of the machines to be sent abroad, it is expected approximately 4800 will be cars and 3200 trucks.

The 1920 business is forecast on the

flood of foreign orders now pouring into the Packard export department here. The company is unable, according to Fred Cardway, director of foreign sales, to meet this demand. In preparation for next year's foreign business, the Packard has reopened its Mexico City agency, closed during the war, and has made arrangements to enter the Italian and Belgian fields. Newly appointed representatives are Estades & Co., Mexico City; A. Chiesa, Milan, Italy, and Engelbert & Co., The Hague, for Belgium, the latter agency being extended from Holland. Fifty vehicles have been shipped to Mexico and Belgium and twenty to Italy as the first Packard after-the-war consignments.

AUTOCAR CAPITAL TO BE \$10,000,000

Philadelphia, Pa., July 26—Stockholders of the Autocar Co., Ardmore, Pa., have approved an increase in the authorized capital stock of the company from \$2,000,000 to \$10,000,000. Stockholders of record July 22 will be given an opportunity to subscribe to \$1,000,000 of the new stock, which is to be issued to the extent of 50 per cent of their present holdings. Any of the \$1,000,000 new stock not taken by stockholders is to be offered to employees of the company.

The Autocar Co. denies rumors to the effect that the company would enter a consolidation of automotive concerns. There has been no change in either the officers or the directors of the company.

ZENITH ADDS TO CAPITAL

Detroit, July 26—The Zenith Carburetor Co. has increased its capitalization from \$40,000 to \$320,000. Of this \$180,000 worth has been issued, all being taken by the present stockholders. The balance will remain unissued. The new money will be devoted to the purchase of real estate and buildings formerly owned by the French corporation of Zenith, as well as the purchase of other assets formerly owned by that company. The new officers of the Detroit company are: President, V. R. Heffler; vice-president, A. Boulade; secretary, M. H. Crawford; treasurer, Julian Gifford. The company is now running 1800 carbureters daily.

LYCOMING PLANS DOUBLE OUTPUT

Williamsport, Pa., July 26—The Lycoming Foundry & Machine Co. have completed plans and construction work has started on what will be the addition of enough space to double the present output of engines. The installation of new machinery in an added story to part of the present machine shop as well as the entire space formerly used as the office, which is to have a new building, is planned. The work is expected to be completed by October.

GILMER JOBBERS MEET

Philadelphia, Pa., July 24—Announcement of a new merchandising plan under which automotive equipment manufactured by the L. H. Gilmer Co. will be marketed under the collective name of the Gilmer Woven Automotive

Equipment Products and with a uniform price schedule, was made at the first sales convention of the jobbers' division of the automotive department held this week. For seventeen years, since the pioneer days of the motor car, the Gilmer concern has been making endless fan belts, belting tire and rebound straps, radiator and hood lace, anti-squeak frame and body lining, asbestos brake lining, transmission lining for Fords, etc.

For the convenience of jobbers and dealers in ordering, all popular makes of cars using a flat-type belt are grouped and numbered. Belts are packed in attractive sales-help cartons, showing the group number, etc.

The convention was attended by representatives from all sections of the country, sessions being held at the Torresdale Golf Club, where President L. H. Gilmer entertained at dinner, and at the Morelton Inn Country Club.

BENEFITS FOR STUDEBAKER WORKERS

South Bend, Ind., July 28—Old age pensions, stock purchase partnerships and life insurance, with an increase in wages and reduction in working hours, effective Aug. 1, have been announced by the Studebaker Corp. A co-operative department has been established to administer the plans and have entire control of all matters affecting the welfare of the employees, which will number 20,000 when the new plant at South Bend is completed and in operation.

CANADA'S SHOW OPENS AUG. 23

Toronto, July 25—Canada's national motor show is that held in conjunction with the Canadian National Exhibition at Toronto. Canada's only national tractor, airplane and motor boat shows under the sanction of the automotive industries of Canada also are held in conjunction with the Canadian National Exhibition.

Last year it is estimated that 600,000 persons attended the motor show.

Some conception of the demand for space for the motor show may be gleaned from the fact that three months ago applications for triple the available space were in the hands of the exhibition authorities. Several British car manufacturers are bending every effort to have models shown, as is Fiat of Italy and one or two other foreign makers.

The exhibition will be opened by the Prince of Wales Aug. 23 and continue till Sept. 6.

A \$5,000 prize has been offered for the fastest trip by airplane to New York, 300 miles, during and from the fair. Many United States and Canadian aces will compete, it is said.

The airplane show is going to be one of the most striking features of the exhibition. At the Leaside airdrome, awaiting assembly, are seventeen flat cars loaded with all kinds of allied and German airplanes. These are the property of the Government, war trophies, and are to be exhibited for the first time at Toronto.

U. S. May Design Grand Prix Cars

Change in Indianapolis Specifications Encourages Maker to Plan for French Event

NEW YORK, July 25—Contest officials of the American Automobile Association and racing men here say reports from manufacturing centers indicate consideration by several leading producers of the question of designing cars to enter the French Grand Prix next year.

In view of the fact that the Indianapolis speedway authorities have changed the specifications for entrants in the 1920 sweepstakes, establishing 183 cu. in. as the standard piston displacement—equivalent to the French 3-liter ruling—it is said the factory heads have been encouraged to go ahead with plans for new creations, which could serve the double purpose of appearing on the track in this country and abroad.

The new Indianapolis specifications, bringing lighter cars and smaller engines to the fore, are expected to prevail as well on most of the lesser American tracks next year, though it is probable that a few contests will be held of racing cars now in the field and good for another season's work.

Except for a few two- and three-car races to be held this month and next, only one day's racing remains on the Sheepsh-head Bay program this year. The card, which may bring about a revival of the Astor Cup competition and offer a 200 or 250-mile event, is scheduled for Sept. 13, the original date having been advanced one week. It is expected that the Chevrolets, de Palma, Wilcox and a score or more of the country's leading drivers will appear at this meet.

FONTAINE WANTS TO DRIVE

Chicago, July 25—In a letter to MOTOR AGE Louis Fontaine, who has been a mechanic to Ralph de Palma since 1915, says he has severed connections with his famous team mate and is out after a car to pilot for the Elgin races. Fontaine has driven at Elgin before as well as at other speedways. He is doing experimental work at the Packard factory at Detroit.

U. S. AIR MINISTER PROPOSED

Washington, July 29—Special telegram—An air minister in the United States cabinet has been proposed in Congress. A bill to establish a department of aeronautics was introduced by Representative Curry of California. This would co-ordinate the air service of the army, navy and marines and assume control of commercial aviation by licensing.

SENATE BILL TO REGULATE AIRCRAFT

Washington, July 24—Licensing of aircraft by the Government and the limitation of flying to marked air lanes and the prohibition of flying over cities are pro-

vided for in a bill introduced in the Senate yesterday by Senator Sherman of Illinois. This undoubtedly is a result of the disaster to the blimp "Wing Foot" at Chicago and probably is the forerunner of national and local measures to prevent similar accidents.

The bill provides that the Secretary of War as soon as practical shall lay out travel lanes, or courses, to be followed and used by aircraft and indicate these lanes by land signals, lighthouses, towers or other evidence to make these lanes known and that all aircraft shall confine their flight in travel to such lanes. It is specified that the air lanes are to be laid out to avoid, wherever possible, cities or other densely populated centers, and dirigible balloons carrying internal combustion engines or explosive gases, gasoline or other explosive substances especially are prohibited from making flights or traveling over any city, village, incorporated town or other densely populated area.

The Secretary of War is directed to license all aircraft and to revoke the license for any violations of the provisions of this act. Violations also are punishable by a fine of not less than \$100 and imprisonment for not more than one year, or both.

A feature of the bill which probably will cause endless difficulties, if it becomes a law, is that the owner or occupant of real estate, by simply notifying aircraft operators, may prevent them from passing through the air over such real estate, and to pass over the real estate after such notification would be considered a trespass upon super-aerial space and can be made the basis for damages just as a trespass upon real estate is. There is no provision in the bill exempting the airplanes from this trespass section. So according to the reading of the bill now, if it should become a law, any land owner or tenant living under an airplane could permanently close the airplane simply by posting a notice.

WESTINGHOUSE TO OPERATE OLD STEVENS PLANT

New York, July 26—The Westinghouse Electric Mfg. Co. is equipping the old Stevens plant at East Springfield, Mass., for the production of automotive starting, lighting and ignition appliances. The factory, which was utilized by the Westinghouse concern for making munitions during the war, will give employment to about 5000 persons and will be operated in addition to a plant engaged in similar work at Newark, N. J.

Some machinery already is in operation at East Springfield, largely to instruct operators, and quantity production will be under way in the fall.

Service Dominates New Samson Tractor Plan

General Motors Product at \$650 To Be Marketed with Maintenance as Essential of Dealer's Contract

SERVICE above everything else, assured and obligatory, is the dominating principle behind the sales policy that has been adopted by the Samson Tractor Co., Janesville, Wis. The company recognizes the fact that in order to make the tractor business a success for itself, the dealer and the farmer, provision must be made for the proper education of the farmer and the assurance that the latter shall receive such attention as will keep him satisfied. Also, the principle that service is worth something and must be paid for is embodied in the plan. Briefly the plan is as follows:

The dealer agrees in his agency contract that he will deliver the Samson tractor to the farm on a motor truck so that it shall arrive at its destination in an undamaged condition. The tractor, when delivered, must be accompanied by a competent man who shall demonstrate to the farmer that the tractor will work satisfactorily, doing the work for which it is intended. This man also shall give the farmer thorough instruction in the operation, care and maintenance of his tractor and shall leave the latter convinced he is able to handle his machine in the way it should be handled.

Obligatory for Dealer

All this is made obligatory upon the dealer, and if he fails, he endangers his agency.

A check is given on the dealer by a blank form which the farmer signs and sends to the factory, setting forth the fact that the conditions of the dealer's agreement relative to the manner of delivery and the extent of instruction have been fulfilled.

A feature which is new in such instances, and which establishes a precedent in the conduct of the tractor trade, is the condition that the farmer pays the dealer a certain specified amount for the delivery, installation and instruction, and that all subsequent service

HERE IS THE PLAN

rendered, outside the warranty, must be paid for at a rate determined by the factory.

The provision covering the delivery of the tractor and the preliminary service the dealer must render in the sales contract of the company is reproduced herewith.

Another clause binds the dealer to pay for the services of a factory expert an expense of \$15 per day, with no single trip to cost less than \$10. In turn, in the order blank the farmer signs when he buys a tractor he agrees also to pay for service rendered subsequently to the delivery.

The Samson tractor lists at \$650, f.o.b. factory. If platform and fenders are wanted, \$50 is added, making the price \$700. The dealer's regular commission on this is 10 per cent. When he takes an

order he charges the farmer an additional \$65 for the delivery and installation charge, giving him in return the kind and degree of service already set forth. In all this makes the compensation to the dealer \$130 on every Samson tractor he sells.

First Service of Kind

This is the first instance in the history of the tractor business where the matter of service has been made obligatory upon the dealer and where the specific charge for such service is determined in advance by the factory. Being an entire innovation there is much curiosity among tractor manufacturers to see how the plan will work out.

No detailed specifications of the Samson machine, now in production and being delivered to the trade, have been given out by the company, as it is the idea of the men who have formulated the sales policy that attention to such mat-

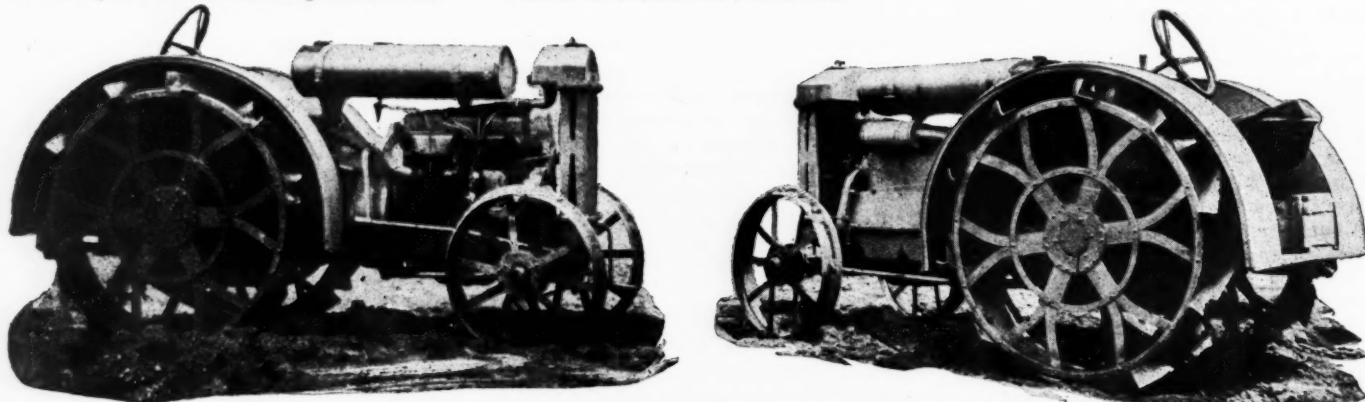
DELIVERY OF TRACTOR AND PRELIMINARY SERVICE PROVISION

INASMUCH as it is a well understood fact that the first few days' wear has much to do with the life and service of tractors of heavy or high-powered type and that great damage to the product and unnecessary expense to the purchaser frequently results from:

- a—Rough or speedy road driving under its own power;
- b—Continuous or extreme use before bearings are properly seated, or cylinders properly glazed;
- c—Failure to remove sediment which is likely to accumulate during first few days of use;
- d—Failure to properly adjust working parts;
- e—Lack of knowledge on the part of the purchaser of the basic mechanical principles;

you agree to deliver all Samson tractors of the heavy or high-powered type from your local station, warehouse or salesroom to the farm of the purchaser, and to give him a course of instruction in the operation and care of same; for which service you are to collect such sums as may be designated by the Samson Tractor Co. in its printed price lists; obtaining from the purchaser a signed acceptance (on the forms supplied by this company), which, with his payment to you of balance of purchase price, shall constitute the delivery of the tractor, releasing the company and the dealer from all further liability for service or otherwise, except such as comes within the terms of the warranty.

The original copy of the signed acceptance to be forwarded to the Samson Tractor Co., Janesville, Wisconsin.



First photographs ever published of the new Samson tractor, whose appearance has been awaited by the trade

ters clouds the sales campaign rather than aids it. For this reason nothing is available but a very general description

of the main points of mechanical construction. Briefly, these main points of construction are:

HERE IS THE TRACTOR

SIMPLICITY of design, rugged construction and ease of maintenance characterize the Samson tractor. It is of the type using no frame; the engine, clutch housing, transmission and rear axle housing taking the place of this. The whole design has been so worked out that one unit forms part of another, thus minimizing the number of parts. An instance is that of the radiator support. This consists of a horizontal platform formed integral with the timing gearcase cover on the engine, while the top inlet pipe of the radiator bolts directly on the engine head. No hose connections are used, except the one on the left side of the engine and bottom of radiator.

The end plate of the engine has integral with it the supporting pivot for the front axle, which is an I-beam with reversed Elliot-type steering knuckles. The front wheels are fitted with roller bearings. The radiator has a cast-iron shell, and cooling is assisted further by a four-bladed fan, belt driven. The clutch housing, integral with the engine block, carries lugs at the bottom for the front radius rods, the latter bolting directly through the web of the axle beam.

Four-Cylinder Engine

A four-cylinder engine of conventional layout forms the power unit, and aside from the apparent large power output accessibility is one of the best features. It has a detachable head and built-in intake manifold. The carbureter is hung high on the block with a short fuel line from the tank overhead. All the fittings, pipes and connections are visible to the operator at all times. Ignition is by a high-tension Simms magneto, driven through a coupling from the timing gears, the latter being of the helical tooth type. The crankshaft is of very generous dimensions and supported by three bearings. The connecting rods are I-beam and both main and connecting rod bearings can be taken up simply by removing the bottom plate.

The drive from the clutch is taken through a double-reduction method, whereby the engine rotation is changed 90 deg. through a worm drive. The short transverse shaft has mounted on it a straight tooth spur pinion which engages with the large spur gear of the differential. The large gear is cast steel and has a face of about 4 in. The pulley for belt work is worm driven from the main driveshaft. The whole assembly runs in a bath of oil, the latter put in through an accessible filler opening on top of the gearcase. Bolted to the sides of the differential housing are the rear axle housings which are made conical. The axleshafts are very heavy and have a machined tapered surface at the outer ends for the rear wheel hubs.

The wheels are held in place by a long key and castle nut. A novel rear wheel

construction has been resorted to. The material is pressed steel and at first glance appears very light, but the method of lacing up the wheel offsets the light material. The periphery is flanged for a short distance for the spokes, which at the hub consists of six members. These are split about half of their length and thus form twelve points of contact on the rim. A ring to stiffen the construction is riveted on at the splitting point. The spokes on the opposite side are staggered.

Steering is by a raked column having a gear working on a quadrant. The bracket for this is bolted directly on the gearcase and the same bracket also forms the rear support for the fuel tank. A long steering arm transmits the movement to a drag link and this to the arm on the wheel spindle. The price includes a governor and the belt pulley. Rear wheel fenders come extra.

G. M. TO DEVELOP PRESENT INTERESTS

New York, July 25—The General Motors Corp. intends for the present to utilize the resources obtained through its increase of capitalization to \$1,020,000,000 in developing what it has, rather than in acquiring new interests, Otis Friend, one of the vice-presidents, states. Denying reports that G. M. C. was negotiating for the purchase of the Electric Storage Battery Co., Philadelphia, maker of the Exide, and the Ajax Rubber Co., New York, Mr. Friend said the corporation was lard at work getting together the loose ends of its varied interests, an undertaking requiring heavy expenditures, and widespread reports of purchases of various other concerns were mere rumors.

Reports said that the G. M. C. acquisition of the Exide would result in its use in the several makes of cars under the corporation's control.

BAKER TRACTORS SEPT. 1

Detroit, July 25—The Baker Tractor Corp., a new company which will place a three-wheel kerosene farm tractor on the market, has completed its first machine and will start his assembly work on the first twenty-five machines about Sept. 1. Pattern work has been completed and most of the castings for the first run of machines are finished. The tractor will probably use an Erd engine.

JEFFERSON RUN TO CANADA

New Orleans, La., July 25—The Jefferson highway sociability run which left New Orleans July 1 reached Winnipeg, Canada, northern terminus of the Jefferson highway, July 21, covering 2400 miles, according to advices from Governor R. G. Pleasant of Louisiana and Mayor Martin Behrman of New Orleans, who headed sociability runners. It was planned to reach Winnipeg by July 20,

but bad roads in Louisiana delayed the cars more than a day. They were welcomed to Winnipeg by Canadian officials and left July 23, returning by rail to New Orleans and shipping back their cars.

Texas was awarded the palm for good roads, according to J. D. Clarkson, head of the Jefferson highway organization, who accompanied the party. The trip was a continuous reception.

PENNSYLVANIA TRACTOR TRIALS

Butler, Pa., July 25—Butler will have one of the two tractor demonstrations arranged by the state college with manufacturers, distributors and other interests. The other demonstration will be held in Harrisburg. The date fixed for the Butler demonstration is Aug. 21-22. The demonstration, which will be held at Nixon Station, will be in charge of a committee composed of E. K. Hirshman and R. U. Blasingame, Penn State College, and T. D. Harman, Jr., Pittsburgh. Most of the manufacturers and distributors of farm tractors in Pennsylvania are interested in the demonstration in one way or another.

Nixon field, which consists of 126 acres, is regarded as especially suitable for a demonstration of what can be done with the tractor on Pennsylvania's comparatively small farms. The ground is characteristically rolling and has been sown to various kinds of crops, so that the conditions represent average farm phases in the western part of this state. Present estimates, based on inquiries, indicate that there will be from 3000 to 5000 persons in attendance at the Butler demonstration alone.

Manufacturers and distributors have arranged to co-operate fully with the state college authorities, and county agents and no less than thirty tractors are being listed for demonstrating. They will not compete in drawbar, fuel, speed or the usual tests, but will show how good a job of plowing and other work they can do under actual farm conditions. Plowing will be done on each of the two days from 10 a. m. till noon and from 2 p. m. till 4.

There will be lectures by experts from noon till 2 p. m. The remainder of the time each day will be devoted to private demonstrations.

MIDWEST TRACTOR SHOW IN FEBRUARY

Wichita, Kan., July 25—Arrangements already are well under way for the next Midwest thresher, tractor and accessory show, which is scheduled for the second week in February. The show will be held in the Forum Garage, the largest garage building in Kansas and with more square feet of floor space than were in the building used by the national tractor show at Kansas City last winter.

For the first time since it was started this annual Wichita show has been given official approval by the tractor division of the N. I. V. A. It will be held under the management of the Wichita Thresher & Tractor Club.

Using Exhaust to Supercharge Intake

Aviation Engine Expert Suggests Novel Method of Induction

ST. LOUIS, Mo.—Editor Motor Age—I am writing you with reference to recent discussions and comments on high-speed gas engine phenomena and general practice and development and desire to mention a few points in which notable improvement is to be desired and to present what I believe are some feasible suggestions.

Importance of war needs demanded further increase of maximum effective pressures at high engine speeds (without counter effects) and consideration of a number of allied topics, essentially bearing on increase of power output, brings to my mind some possible solutions and improvements in detail.

Maximum Effective Pressures

During the last two years there has been much talk of maximum and mean effective pressures, of compression pressures, of ignition speeds and combustion phenomena, of pre-ignition, maximum piston speeds, indicator diagrams, of valves and valve placement, of supercharges, of intake gas speeds, of valve lift, of altitude power losses, pre-compression, six-cycle, pre-heating, volumetric efficiency, artificially-cooled valves and much more of a similar nature, all presented in a sort of hodge-podge of complaint and misinformation. Lately there has been some emphasis placed in a sort of "we-view-with-alarm" attitude upon the analysis—long known—of the power and heat losses of the conventional gas engine layout, but insofar as

I can see there has been little effort toward tracking back these power losses through a reasonable and sane analysis and nothing in the direction of practicable solution of the problems beyond a rule-of-thumb follow-the-leader manner of procedure.

First and foremost in consideration of

EDITOR'S NOTE—Not all the engineering ideas come direct from the factories—whether or not the suggestions in Mr. Frazier's communication are sound remains to be seen. They are worth consideration at any rate, and comments from readers will be appreciated. Mr. Frazier's experience with men and engines on the track and later at Kelly field removes him from the class of impractical dreamers, whether the present suggestion be practical or not.

the shortcomings of the gasoline motors in the matter of power output is the need of not so much for a "super" charge at high piston speeds as for a normal charge. The feasible method to go about finding a remedy is to recognize the limitations of things as they are. The problem presented in keeping up the power output at high speeds is simply that of starvation and its remedy. The pitifully puny power upon which we depend to fill the combustion chamber through narrow valve ports, crooked and con-

stricted passages, and the silly obstructions in the conventional carbureter is at best a pressure of a mere 14 lb. per square inch.

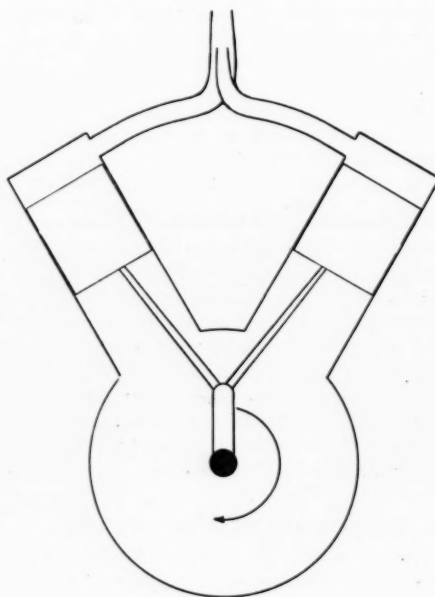
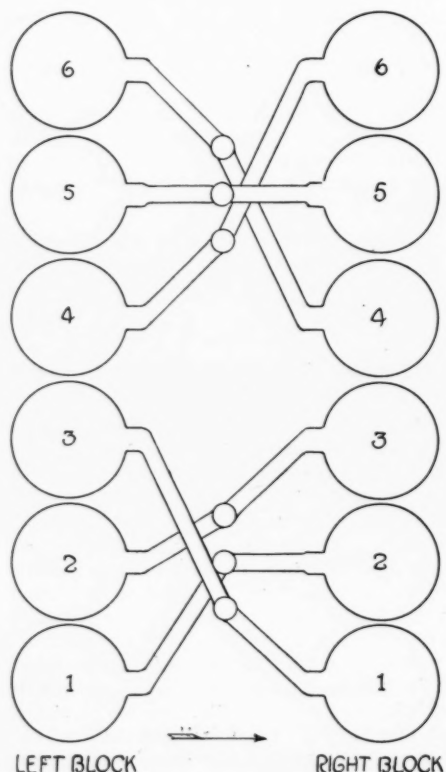
After encountering all the obstacles that man designs to place in its path it is sheer good fortune that the force remaining is even half that with which it starts. One might think from a glance at gas engine design that the vacuum depended upon to charge the cylinder with gas is an irresistible force and that any amount can be wasted. Such is far from being the case, and the sole progress of the internal combustion engine in terms of piston speed is a story of the recognition of the limitations of gas travel and, in view of same, the course taken is to offset them.

Cam design lends itself to a number of variations governed by the mechanical design of the engine and the power demands, but insofar as there is any appreciable difference development up to the present has been brought about solely in the shifting to the proper points, the opening period of the exhaust cam and the closing period of the intake. Other conditions may bear on the subject, but although they contribute to the final result they are not the direct cause of the additional power obtained. The early opening of the exhaust valve, although allowing a very considerable portion of the still expanding and useful power stroke to escape, is vitally necessary in present design so that at high engine speed the pressure above the piston may be sufficiently lowered before traveling far upon its up stroke. The early opening is necessitated by insufficient valve area and results in inefficiency and great loss of power at low engine speeds and is largely responsible for that 40 per cent power loss through the exhaust.

Valve Area Limitations

In recent development all possible types of valve action have been tried and valve areas have been increased to their limit. Their limitations are quickly apparent. Inertia places limits upon valve speed and lift, and lack of available space prevents increase in area and the heavy overload in present day airplane powerplants shortens valve life, warps valve seats and forces cylinder heads out of shape. The bulk of the exhaust is out before the piston does more than start upon its upward stroke, and the remainder of the work is simply that of scavenging and calls for no excessive requirement from the exhaust valve.

With these facts in mind it seems queer to me that no one has as yet adapted the discarded auxiliary exhaust to do duty at this stage. It has the virtue of excessive area in that the outlet is really a piston-covered port of large size and the valve merely a seal against air dilu-



Frazier's suggestion for connecting exhaust pipes on a twelve-cylinder engine

tion on the intake stroke. The valve has plenty of time to open and close, and therefore no need exists for a restricted lift, nor is there need for frequent re-grinding. So far as upkeep is concerned, the advantages which result in relieving the exhaust valve of its excessive duty far offsets the objectionable multiplication of parts.

Variation in intake valve closure is made use of in the effort to form a suitable compromise in filling the combustion chamber at medium and high speeds. That which results in proper performance at lower speeds cuts short the gas stream at high speeds; or an improvement at high speeds through the use of gas inertia in the manifold and late closure is accompanied by a power loss at low speeds, in that the piston forces the gas back into the manifold. This has the doubtful advantage of preventing excessive compression at lower engine speeds and presents no interference at speeds at which it is of highest importance in obtaining rapid ignition.

Would Discard Intake Manifold

The remedy, of course, lies in doing away with the intake manifold. It is a futile sort of thing at best and provocative of much more trouble than we realize, but like a wart, we have become so accustomed to its presence that it seldom occurs to us to get rid of it. It is not only weighty, and serves as a condensing apparatus for the gas which we have been to so much trouble to vaporize, but generally results in rushing huge gulps of liquid gas at intervals to certain of the cylinders farthest removed from the source of supply during periods of acceleration. If the engine stops, the sudden cessation of suction is followed by the ejection of a half pint or so of raw gas via the air intake—excellent material for the foundation of first-class blaze after a stall. In no case is there the ideal equal division of gas for each cylinder. It hasn't and cannot be done. About all that can be said for the intake manifold is that it fastens the carbureter to the cylinders, and sometimes it fails in that.

But, you may say, one would be forced to provide a carbureter for each cylinder, weighty and delicate, to say nothing of synchronizing adjustments. But carbureters need have no adjustments and can be made alike, and the remaining joke—the float chamber—can be eliminated entirely. The movement of the air stream is quite sufficient to operate the needle valve, and the only remaining condition necessary is that the gasoline have a constant head. Spring-operated restrictions on the air supply should be taboo, and under the same heading should be that mechanical abortion, the butterfly throttle valve. In short, attached to each cylinder head there need be little more than an elaborate elbow and the former intake manifold will have shrunk to a mere tube of small dimensions for gasoline.

This now brings us to the main issue, that of super-charge, and its accomplishment without the use of air compressors, crankcase compression or exhaust

and mechanically-driven turbines, all enemies of mechanical efficiency. One merely needs to put two and two together and abide by the result. One has on which to draw for power (without cost) the famous 40 per cent which is lost down the exhaust pipe. On the other hand one needs, at high engine speeds and great altitude, some method of pushing or pulling through the carbureter the intake manifold and valves and into the cylinder a greater charge of gas than the normal atmospheric pressure is able to accomplish. Ordinarily the down stroke of the piston is depended upon to produce the suction necessary to allow the atmospheric pressure to force the gas into the cylinder, and the piston has its maximum speed only at the middle of the stroke. The first third of the stroke is of little avail in getting in a charge. Now it may be considered impossible to increase the atmospheric pressure but it is not unfeasible to start it sooner on its duty of forcing the charge through the valves. That, in short, is the sanest procedure to follow in the effort to super-charge, in that at the beginning of the stroke a slight effort expended in forcing a charge will show up surprisingly at the end of the stroke.

In the past there have been attempts, more or less futile, to gain (by the overlapping of the exhaust closing and the intake opening periods) a questionable amount of charge acceleration through the sudden departure of the exhaust. This was always a lost hope, for the volume of the exhaust had left for good some 200 deg. before, and all that remained was back pressure and the moderate inertia of the column of scavenged gas forced down the exhaust pipe by the upward movement of the piston. Even that little is discounted by the pressure of the exhausts of other cylinders in the manifold and the back draft that seems always to be present 180 deg. after each explosion passes out.

But there is still the power of the exhaust to be utilized, and the need for it to start the incoming charge on its way long before the piston is able to do it; in fact, the proper time to begin is about 30 deg. before top dead center and continue the effort until 30 deg. after, at which point the piston is in position to take up the load, and the column of gas having been started and accelerated continues to follow the piston down the stroke. Since one is unable to use the force of the exhaust occurring 45 deg. before bottom center to do duty some 180 deg. afterward in drawing in a charge in the same cylinder, the natural course to follow is to use it for the benefit of some other cylinder. The proper sequence will be found only in twelve-cylinder engines set at 60 deg. (Attention of Mr. Vincent and Ralph de Palma.)

Connecting Exhaust Pipes

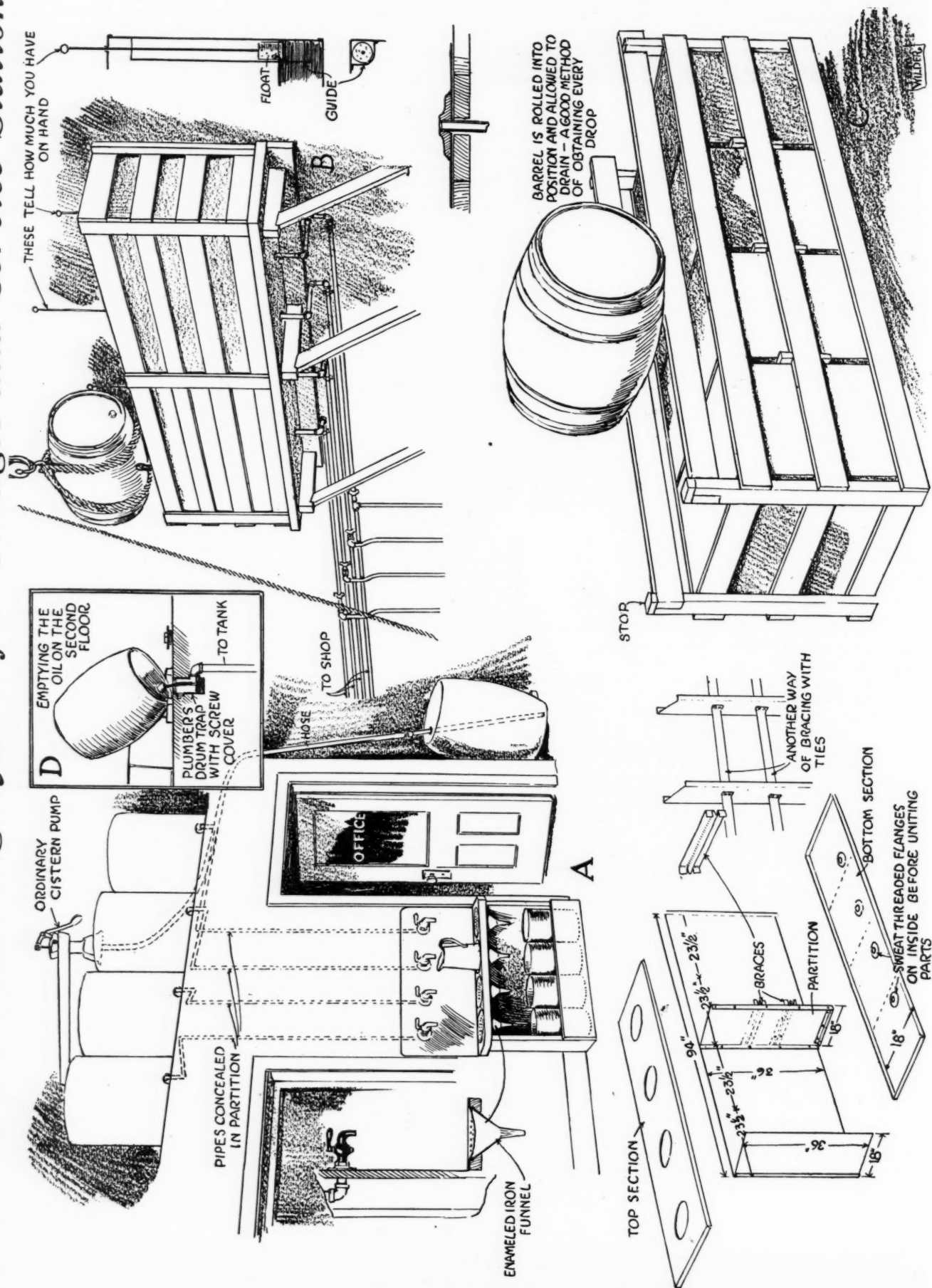
In such engines by connecting the exhaust pipes of certain pairs of cylinders, in a manner which will promote violent ejector action in either pipe, one is able at all times to have the intake charge of a cylinder accelerated through suction, via open intake and exhaust valves, by an exhaust from a cylinder in the opposite block. It so happens that these opposite cylinders serve each other alternately, and their respective exhaust pipes are connected permanently, each maintaining ejector action upon the other. The valves must be heavily overlapped, the intake opening 30 deg. before center and the exhaust closing 30 deg. after, but the preferable construction would be some form of variable intake timing by a sliding camshaft.

The firing order should be 1-5-3-6-2-4 in each block, the cylinders to be connected would then be L-1 with R-2, L-2 with R-3, L-3 with R-1, L-4 with R-6, L-5 with R-5 with the crankshaft revolving clockwise and L-6 with R-4.—Earl E. Fraizer, More Automobile Co.



Garage and salesroom of Goodell & Mead, Inc., Pasadena, Cal. The salesroom is in front, and the garage is entered through the arch and rear court. The building is faced with buff brick, with roof of green tile and green trimming

Practical Oil Handling System for Garages and Service Stations



Eliminating "Oil Barrel Plague"

Practical Methods for Use in Garages Without Approved System

FLOOR space is money. Floor space littered with rubbish or parts of questionable value is wasted. Floor space littered with oil barrels full or empty also is wasted.

Recently the writer saw a well-equipped garage, the repair shop of which was so full of barrels, crates, empty tanks and other litter that it would be impossible to get a car into it until a space was cleared. What owner would want his car worked on by a man who kept such a shop? Why have a large floor unless it is available for its proper use?

MOTOR AGE recommends that wherever possible one of the approved systems of handling oil now on the market be used, but for the owner who thinks that he cannot afford one of the ready made systems on the opposite page are several practical ideas for the elimination of the "oil barrel plague."

They are suggested on the theory that every garage, no matter how small, has some space above car headroom where the necessary tanks may be located. From there the oil is piped through permanently installed pipes to the desired location and drawn off through a proper valve with no appreciable waste.

Hoisting Oil Barrels

A barrel may be hoisted by block and tackle, allowed to drain into the tank, and then you are through with it. You can send it back or otherwise get it out of your way and sight.

When an elevator is available barrels may be taken to the second floor and emptied through the floor into suspended tanks, as at D.

As long as these tanks are out of sight almost any contraption that will keep the oil clean may be used. Oil barrels themselves may be stood on end after a pipe connection has been made through the wood by a long thread, a couple of washers and locknuts and some packing.

The junk dealer may have some old sheet metal tanks that will hold a barrel or more of oil, preferably more, and if these are put out of sight, where is the harm? There are lots of old kitchen range boilers lying around that will not hold water but with a little solder would hold oil forever.

You can make your own tanks of galvanized sheet iron also.

In constructing the tanks they may be made all in one, as B—see also detail—or separately as C. If all in one, they will need braces of some kind on the partitions or they will work loose from pressure coming first on one side, then on the other. Separate tanks take more material but are easier to make.

Installation A is a battery of stock gasoline tanks with the cocks removed

and pipe connections made in their place. They need considerable space and are more susceptible to damage unless protected than the protected square tanks but are readily obtainable.

Installation B is a narrow deep shape designed especially to set on a shelf. With the dimensions given, the compartments will each hold over 66 gal.

Galvanized iron comes in various widths 96 in. long. The sides of this tank are made by two pieces 96 by 36. The ends and partitions are made from one more piece the same size. Top and bottom are made by cutting a piece 96 by 40 into two 20-in. strips, or by two 20-in. pieces. These are both odd sizes, however, and 24 in. of material may have to be used. Be sure to brace the partitions as we show or otherwise.

Various methods of emptying the barrels into the tanks are to be found, but the methods shown in B, C and D are preferable in that they may be left to drain until every drop of oil has run out. The oil also may be pumped up as shown at A or even emptied with pails, but the latter method would involve too much waste and the first would always leave the suction pipe full of oil which would run back into the barrel and have to be drained out afterward.

For delivery the scheme shown at A is extremely simple. A small shelf with enameled iron funnels such as may be obtained anywhere is put up, and over this and extending up the wall 18 in. or 2 ft. is tacked sheet brass or galvanized iron, all in one piece. Over the funnels this sheet metal previously has been sunk slightly and perforated so that any oil that escapes the measure can drip through the perforations into the funnel and thence into the cans underneath. When the cans become full the contents may be used direct or returned to the high tank. All metal stopcocks should be used for this purpose, not Fuller bibs or anything of that sort with rubber or fibre disks.

M. A. D. TO HOLD FAIR SHOW

Milwaukee, Wis., July 25—Although the Wisconsin state fair in recent years has come to be known as one of the greatest expositions of the automotive industry among enterprises of this character in the United States, plans for this year's fair, to be held Sept. 8 to 13, contemplate even more elaborate attention to the cars, trucks and tractors. As in the last five years, the Milwaukee Automobile Dealers, Inc., will have complete charge of the show in Motor hall, an immense fireproof exposition building. This will be reserved for cars and trucks.

The tractor department, which will be handled directly by the state department of agriculture, which conducts the state

fair, will occupy 50 acres in all. In addition, arrangements have been made for using several large farms in the vicinity of the state fair park for demonstrations and exhibitions. Friday and Saturday, Sept. 12 and 13, have been designated as automotive days. The motor show details are being handled by Bart J. Ruddle, secretary and manager of the Milwaukee Automobile Dealers, Inc.

TO MAKE PHOTOGRAPHIC FLIGHT

Washington, July 25—Forty-six cities and towns in six states on the Atlantic coast will be visited by a photographic recruiting squad of the Air Service, leaving Langley field, July 22. The expedition will comprise five Curtiss airplanes accompanied by a truck trailer, including complete photographic developing and printing establishment. Recruits will be taken to observe the practical work accomplished.

The planes will fly in formation and remain in each place visited long enough to acquaint all interested with the work. Aerial acrobats will be performed. Photographic maps of the various towns will be taken. The photographic division of the Air Service requires specially qualified men and hopes to secure enlistments as a result of the flights.

AIR MAIL CHEAPER

Washington, July 25—By an order of the Postmaster General which fixes the rate of postage on mail carried by airplanes at 2 cents an ounce the air mail service was placed on the same footing with other first class mail. The experiments during the year have demonstrated possibilities for increased efficiency for mail transportation beyond the early expectations of the department. Since the conclusion of the war, by the use of the Liberty engine and the availability of larger planes salvaged from war stock, mail in greater quantities can be carried as well as greater speed made by reason of the more powerful Liberty engine. Thus, approximately more than 10,000 letters a day for Seattle, San Francisco and Los Angeles and other points on the Pacific coast which fail to connect with the westbound 8:40 p. m. train out of New York are now being advanced 24 hr. daily to their points of destination.

In the same way mail from New York that did not catch the 5:15 p. m. train for the west now being delivered in Chicago in the afternoon instead of the following morning.

Arrangements are being made to place on the New York-Washington route the three fastest airplanes in the air mail service, each having a capacity of 18,000 letters and a maximum speed in calm weather of 132 m. p. h.

SERVICE BY AIR GIVES MILTON UNIONTOWN RACE



Milton in his winning car and, in oval, delivery of bearing to airplane which took it most of way to race

HOW Tommy Milton July 19 won the Independence derby at the Uniontown races is now only a piece of track history.

But how the real race, the one you did not see, started a trifle after dawn and, running through six grueling morning hours, finished, a bit less spectacularly but none the less triumphantly, is related by Milton himself. The performance on the speedway was a triumph of racing, but back of the curtains was a triumph of service.

Milton was driving a Deussen car, and Friday, while tuning up for the races next day, broke a bearing in his front wheel. That broken bearing came mighty near to putting Milton out of the race. He tried hard to secure the bearing in Uniontown, but no part of this variety was available. He went to Pittsburgh and ransacked every likely spot and in this case found Pittsburgh as barren as a New York cabaret July 1.

Now everybody knows Detroit is the home of not only most of the motor cars but of the parts of which these motor cars are made. It would be easy to get the missing part in Detroit. The rub came in the fact that Detroit was many miles distant and the races were scarcely 20 hr. away.

Detroit, though, was the only hope, and to Detroit Milton turned. An order was wired to the Bearings Service there. They had the bearing but could not hold out very much hope that Mr. Burleson's department could deliver it much earlier than the Monday following the races. In fact, in the light of present P. O. condi-

tions, they weren't sure that he would ever receive it. Milton wired for service, he must have that bearing within 24 hr.—and Milton got it.

Here's How

H. J. Detterich, an official of the Service Bearings Co., knew of only one way

THIS is the story of how a company went the limit to give service. Tommy Milton, driver of the Duesenberg car in the Uniontown races, had to secure a bearing from Detroit within 20 hr. He wired A. K. Hebner, general manager of the Bearings Service Co., to get him that bearing. How Hebner rushed the bearing to Milton by airplane, getting it there in time for Milton to win his race, is graphically told in this story.

to get the bearing to Milton in time for the race. It was only a hunch, but he played it—hard. It was almost midnight when the final frantic appeal was received from Milton, but that didn't interfere with Detterich's plans.

The Universal Aviation Co. was at Morrow field, just outside of Detroit, and J. T. Patterson, general manager of the company was hauled, not too willingly, from his bed and requested to have a plane and pilot ready for a trip to Uniontown by daybreak. The plane was easy, the company had "oodles of 'em," and Lieut. C. A. Stocking—more commonly called "Sox"—agreed to attempt the flight. He had never been so far away

as Uniontown before, but if Mr. Detterich was willing to risk his neck, he was willing to try. So he dug up a road map somewhere and drew a pencil line from Detroit to Uniontown. If they were to arrive in time, they must fly as the proverbial crow does.

The sleepy mechanics who had been working on the plane half the night, held them up until well after sun-up before they would pronounce the plane ready for the flight. That made the hour a little after 5. A fog followed the dawn, and as it would have been useless to start with this shroud covering all the landmarks another precious hour went by the board. But they got away a little after 6 o'clock with Stocking in the pilot's seat and Detterich riding behind.

Stocking drove for exactly 3 hr. 50 min. when trouble began brewing in the engine. Honestly, he hadn't expected it to last that long, and finally he was forced to land. As something has to be done quickly when a plane runs out of power, he did not stand on the order of his landing but brought up on a hill a few miles from Wheeling.

Now Wheeling, as you may know, is a far, far cry from Uniontown, and the landing place which the plane had chosen was somewhat short of human habitation. A farmer who owned a car finally was found, and the race was on again.

The spare part was handed to Milton a good 2 hr. before the race. He and his mechanics adjusted it, and a little later Milton had that Deussenburg traveling 100 m.p.h., to the confusion of the former track record of 98 m.p.h.

Star Auto Co. Plan Well Laid Out for Corner Garage

Showroom, Garage and Repairshop

F. LE COCQ, proprietor of the Star Auto Co., Pella, Iowa, has utilized a corner location for his salesroom, garage and repairshop.

The showroom occupies one of the front corners of the building, looking out on both streets and having large

display windows on two sides. The office and its adjuncts are directly back of the showroom.

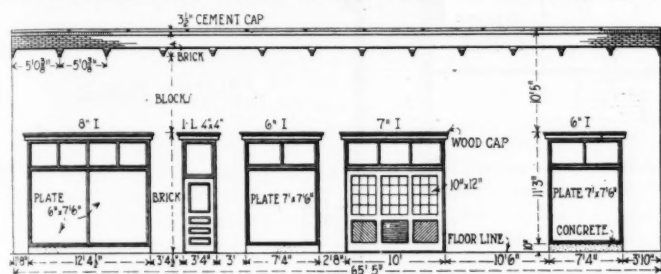
The garage surrounds the office and showroom on two sides and has driveway entrances from both streets.

The shop runs clear across the back

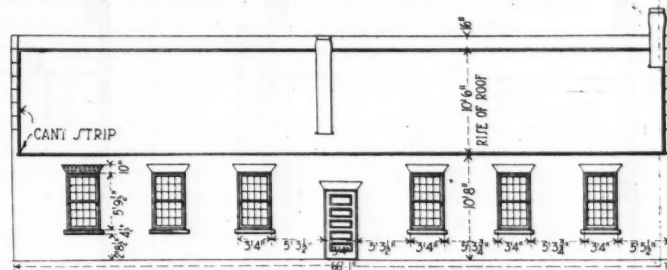
end of the building as shown herewith.

The building is one-story, of brick construction, and presents a substantial and attractive appearance.

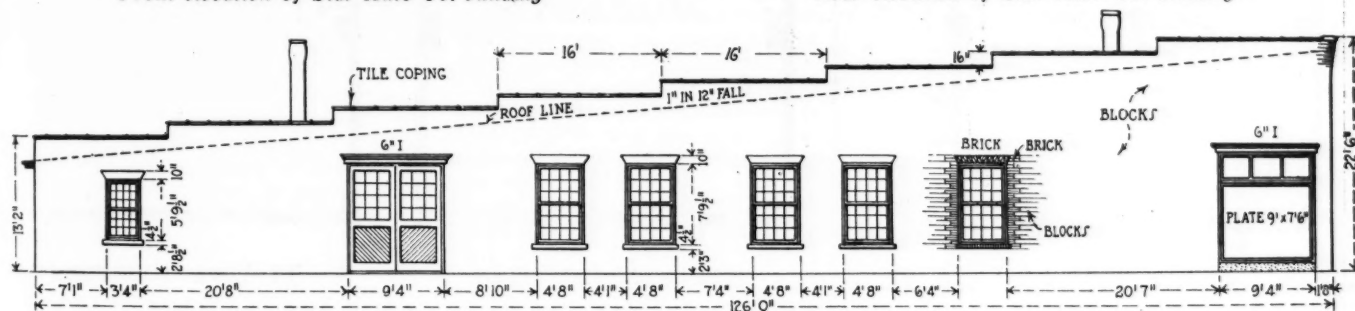
The operation of the plant has established the fact that the plan is well conceived for a corner location.



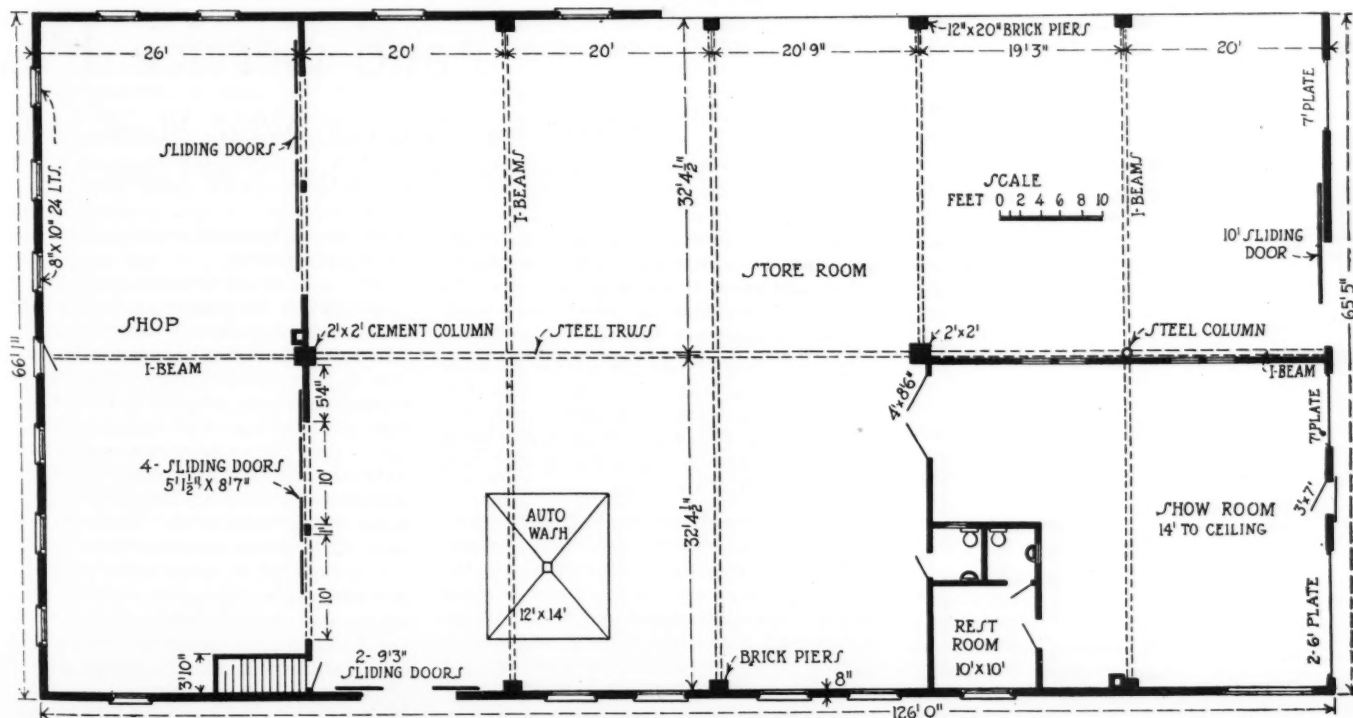
Front elevation of Star Auto Co. building



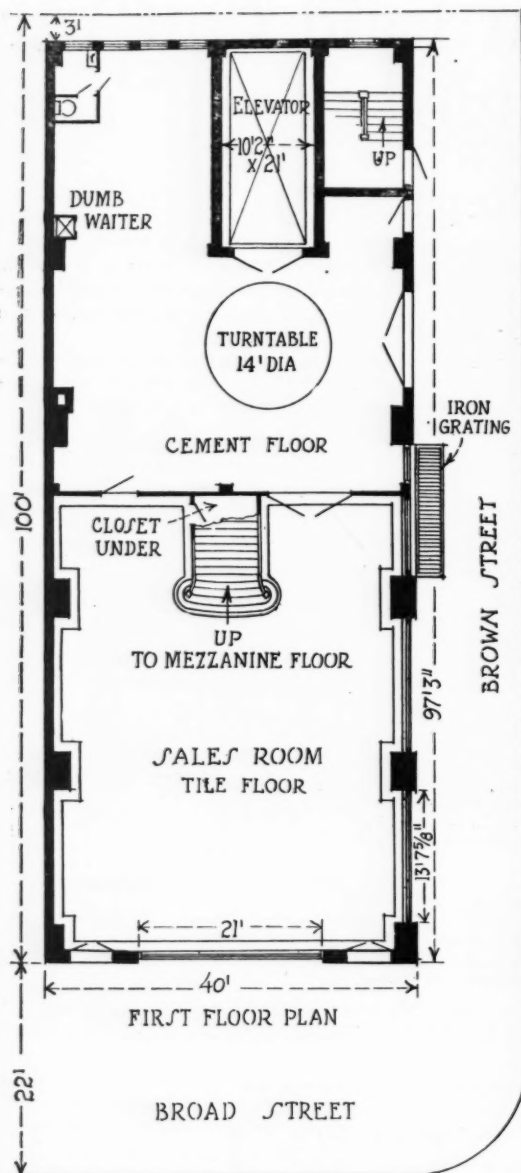
Rear elevation of Star Auto Co. building



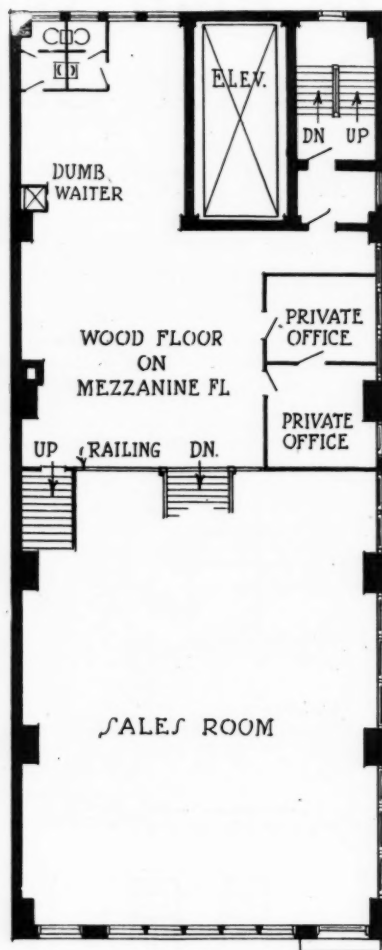
Longitudinal section of F. Le Cocq's place of business showing details of construction



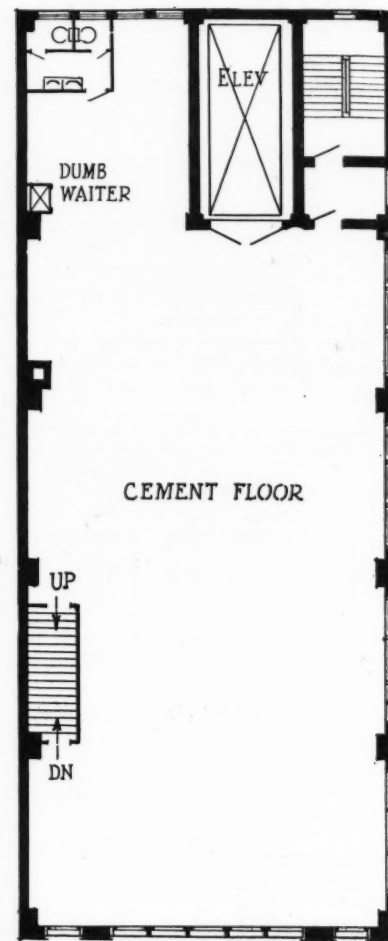
Floor plan of salesroom, garage and repairshop operated by F. Le Cocq at Pella, Iowa



Ground floor, mezzanine and shop floor of combination car and truck sales, service and garage building



MEZZANINE FLOOR PLAN



TYPICAL FLOOR PLAN

Combination Sales and Service Plan

Ideas for Dealers Who Have Added Truck to Their Car Lines

DEALERS seeking to increase their business by adding a line of trucks are forced to make many changes in their service stations and garages. This dual service presents a more complicated problem to the dealer, as the two types of work differ.

There are dealers also who, since adding trucks, have become so much pleased with the bigger aspect of the truck service that they now are emphasizing this end of the business.

Money-making Garage

The money-making garage of the future without doubt is the strictly commercial garage. It does business on a much more lavish scale than the car garage. And what is true of the garage in this instance is also true of the dealer service station, or combination service station and garage. The commercial car service station has to buy more oil and

gasoline, for instance, with every other purchase in proportion. The expense for labor and other items is greater, and the income from looking after this more expensive business larger.

Where a dealer has the double problem of the car and the truck service station, he has to be careful, keeping each end separate, or departmentized, with labor adjusted carefully to give the proper care to both kinds of business.

This double business has been compared to the combination small bakery and large restaurant conducted by the same person or company. There is a big and a moderately small end of the transaction, and there is a wide divergence in method of conducting them, although the two services are basically related.

The dealer who contemplates adding trucks to a line of cars can profit by examining the plans and consulting the

methods of those who have preceded them in such ventures.

The matter of the site or lot and its possibilities for enlargement or special treatment to accommodate the new line of stock, for instance, cannot be held to any hard and fast rule. It is stated by some experts in service station and garage construction that wherever practicable they favor long-span buildings for both commercial and combination commercial and car buildings, 60 ft. and upward being preferred. While the tendency in building commercial service stations, now is to seek outlying lots and remove them from the vicinity of the salesroom, most dealers who are doing the combination business are obliged to make shift with their present premises.

Combination Sales and Service

The accompanying illustration is the plan showing ground floor, mezzanine

and shop floor of a combination car and truck sales, service and garage building in Philadelphia, which was built in the spring of 1917. The entire building, which is handsome and substantial, being constructed of glazed-surface stone composition, cost, irrespective of temporary equipment, \$85,000, that portion devoted to shop, service station and garage costing approximately \$30,000. The floor space actually available is 14,000 sq. ft.

The building was designed principally to care for the type of passenger and commercial cars handled by the firm, both vehicles being gasoline-propelled. There are no facilities for charging electric cars, although there is full equipment for starting, lighting and ignition systems. There has been no attempt to care for the tire end of a service business, the company not desiring to enter that field. Any other service given by the conventional service station and garage is provided for.

The shop, which is on the third floor, is equipped with power lathe, high-speed wrenches, tools to straighten fenders, put on headlights and sidelights and straighten axles, as well as electric drill, electric testing motor with stand, jacks of various types, dynamo and engine frame, grinding apparatus, acetylene welder, aligning blocks and chain hoist. All power equipment is on the right side as one enters and conveniently placed are portable benches. Shop and stockroom, the latter on the mezzanine floor, are connected with the ground floor by a dummy elevator operated by electricity. This dummy, of course, is used mainly for moving small parts from one department to another.

Arrangement of Parts

In the stockroom, or supplies department, parts for the passenger and the commercial cars are in bins on opposite sides of the room, each bin being designated numerically as well as alphabetically as to each compartment, a rubberized curtain being let down in front of each one nightly, to keep out accumulation of dust and possible rust. All special iron work is done in the shop and not in the service station.

In the body shop, which is a division of the workshop and on the same floor, special orders for commercial body work are executed and all lettering, lining and other painting done. Here is the usual equipment for a coach shop, and there are racks or trestles for elevating bodies to be painted or lettered. The canopy cutting and trimming sections are in this division. The firm, however, does not do a considerable business in the line of special-order bodies.

In each department all tools for that particular section are kept in systematic order in small receptacles, into which they fit with little room to spare, and are issued only on slip requisitions by the shop foreman, the slips being checked up carefully against the return of the tools as soon as they have been used.

It is a cardinal principle among architects planning for purely commercial garages to make all elevators oversize, that is, sufficiently roomy to take on

Modern arrangement of sales and service building, affording 14,000 sq. ft. of floor space. The shop, on the upper floor, is connected with the stockroom by a dummy elevator electrically operated. This serves to separate the transit and shop departments. Note the elevator for cars is at right angles to the street entrance and the turntable, close to the elevator, is centered on the axis of the door and elevator, beneath which is the gasoline tank.

the largest vans made, care being taken to have the minimum height of doors and elevators frame at bridge clearance, or 14 ft.

In the particular instance of this firm's building, however, as the trucks it handles do not run into the large van or inter-city hauling size, the elevator is only of moderate proportions and is operated by a 7-hp. engine, accommodating trucks of from light express, or delivery size to ordinary 5-ton models. The big van must be attended to either in the service station or on the ground floor or outdoors on the back street, which is little used for heavy traffic. It is an advantage to the concern that the building has entrances from the streets at front and rear. As always should be the case, according to expert service station architects, the elevator is at right angles to the street entrance and another favorable point is that the large turntable is centered on the axis of the elevator and the street entrance.

Through having the turntable thus centered, the car that has just entered the station, with a minimum expenditure of time and effort, can be shot toward and on the elevator or, by a quarter turn, always going ahead, toward and into the salesroom, should that be desired. The turntable on a central axis also is especially valuable in the case of cramped space in the service station.

When space is limited and with a growing business one never knows when this contingency may arise an economical method is to have the gasoline tank, as in the case of this particular garage, located in the elevator pit, instead of in a special compartment below the sidewalk, as often is the practice.

Doors in two sections are favored for the most modern service stations. The transom usually has a hinge at the top to hoist it out of the way of the incoming cars. There should be a door for entrance and exit of persons as well as the sliding doors for the cars, and this personal entrance should not be cut in the larger one. Most persons consider such an arrangement an abomination, as it is a veritable stumbling block and, because of high sill and low clearance, bumps more heads and breaks more stiff hats than it is worth. To stoop and, at the same time step high, is more of a calisthenic feat than most folk care to perform when making a simple exit or entrance. Then, too, such an arrangement is bad for the larger door itself, as having the smaller one paneled in weakens it.

The gasoline tank in the elevator pit in

this building contains 400 gal. Special precautions are taken to prevent evaporation, by flanged cover and lining of tank, the cover hooding over the top and fitting closely. Of course, the elevator pit, in such case, has to be much deeper than ordinarily is the practice. Portable air pumps are used. They may be stationed inside or outside the building and usually are kept outside to afford more room. The sidewalls have outlets every 12 ft. for electric wiring and plugs for inspection purposes, proving very handy for the workmen in moving among lined-up cars. Where possible the trucks are placed on the left side as one enters from the rear street, and the cars opposite, although this arrangement sometimes is jumbled on account of lack of space when more than the usual number of vehicles are assembled.

Most modern service stations and salesroom combination buildings have their fire tower with enclosed stairway, and this is a great space consumer but necessary in many cities to comply with the fire ordinances. Heating plants usually have to be isolated, with access from the exterior of the building. The heating plant in this building is in the basement and has an outside stair.

The necessity for keeping the departments as distinctly separate as possible was recognized early in the car service station and garage business, but it is even more imperative where there is commercial car stock in a building, the labor problem complicating matters.

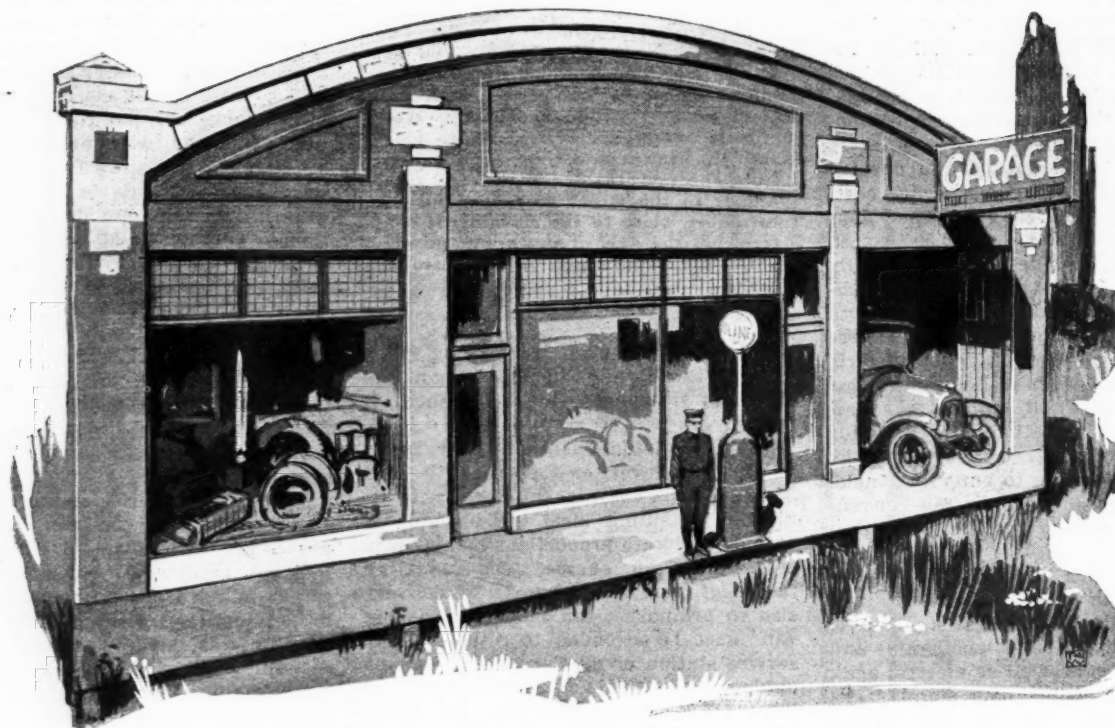
"Keep your transit men away from your service department," is the sound advice of one Philadelphia sales manager, who has been superintendent of the building of several service stations and garages. "If you don't, they will pester the life out of your mechanics and literally 'hold the watch' on them for trivial jobs.

Good Aisle Width

"This sort of thing discourages as well as annoys the average mechanic, and his tendency will be to soldier on any job he may be doing at the time, to stall off taking up the special job the transit men want him to do. I have noticed this in hundreds of cases. Have your shop on an upper floor and thus minimize this serious handicap."

More than one car dealer who has taken on trucks, with their attendant transit problems, has found it expedient to make room on an upper floor for the shop. When the stockroom can be located on a mezzanine floor, a convenient arrangement is to have this hooked up with the shop by a dumbwaiter, on which parts and the like can be conveyed readily and quickly, saving many steps.

Where possible because of sufficient space, it is considered by some architects a good plan to have an aisle 15 ft. wide in the center of a space of 60 ft. or thereabouts, lining up cars on one side and trucks on the other but so arranged that there will be plenty of room for the trucks to make an easy turn in going out. Where arrangements provide for sales and service in the same building and on the same floor, some prefer to have a clear space through from the sales office,



Call your building a mammoth signboard and treat it accordingly

Appearance Is The Best Advertisement of a Garage—Bill Strong

“WINNING a new customer is usually a case of love at first sight and, therefore, the general aspect of your business plays the leading role in inducing him to come in and make a purchase.

“Whether he comes again or not depends on how well your business fared under this first inspection. Of course, we know that he came in to buy something and I am willing to assume he got exactly what he wanted. Undoubtedly the price was right and the service prompt. All that is on the surface. The customer made a purchase, but if you dismiss the incident with that statement you are woefully underestimating its significance—for this incident is the customer's formal introduction to your business! Was it favorable?”

Difference in Progress

The speaker was Bill Strong, and he was talking to John Griffin. They had been brought up in the same town and had embarked in the garage business at about the same time. Griffin, however, had made little progress. He had worked hard, but had barely made a living and that was all. His location in a prosperous town about 50 miles up the river was just as good as Bill's and so the difference resolved itself into a question of management.

“In plain English, since you've asked me for my honest opinion as to what is wrong with your business, your place is dirty, untidy and therefore repelling.

Those words are strong and I hate to use them, but they are the only ones which fit. There may be other ways in which your business needs improving, but the first, foremost and fundamental shortcoming is its appearance. Clean it up and straighten it up and the other necessary improvements will come automatically. You can't prevent 'em any more than you can the profits that will then ensue.

“Start right in at the front door and don't stop at anything inside or outside, even to insisting on daily shining of the porter's shoes. Foolish? Not a bit of it.

“What should you do? Where should you begin? I couldn't possibly tell you everything without making a thorough inspection of the place, but from my memory of its appearance I can recite enough things to start you going in the right direction.

“First of all, your gasoline pump needs repainting badly. It's an eyesore. Should be repainted every spring whether it needs it or not. That spic and span appearance will bring a lot of extra trade in a year, and besides the brighter its red is the more attention it will attract, yes, compel.

“You need a new electric garage sign. The one you have is getting dilapidated and is entirely too cheap to express your business adequately. But if you can't afford a new one, at least have the old one fixed up.

“Your windows are fogged with dirt. Have them cleaned once a week whether

they need it or not. They probably will, even if you don't think so.

“Take down all those tin signs which were given you by kindhearted accessory manufacturers and which so disfigure the front and sides of your building. One or two signs rightly placed are all right, but you have too many and some have remained up so long that they have rusted and so make your place look like a junk shop.

Fix the Driveway

“The surface of your cement driveway is crumbling and should be fixed. This makes a bad impression on the customer.

“Get a new compressed air hose and especially a new acorn air connection. When I used it the other day it leaked air so badly that the average man would cuss you much more because of its condition than he would thank you for the free air thus supplied. The portable air compressor also needs a new coat of paint.

“Study the outside of your building. No doubt there are many other details requiring attention that I cannot recall at the moment.

“Let's go inside and take a mental look at your accessory store. You haven't changed your window display in two months. In fact I don't believe that you could call it a display. You have used it more as an extra shelf where you put things that you couldn't find room for elsewhere. It is liberally coated with dust, there is a cobweb or two to add to

the picture, and some of the things have been in there so long they have faded. You're not getting a cent's worth of business from that window and worse, it is driving lots of business away.

"Don't say you haven't got the time to do these things. Of course, you haven't, but you should hire someone to do it. You could easily keep one man busy cleaning all the time around your garage, and you'll find that this investment will bring enormous returns. Even though I felt that I could not afford to have a man just for this, I would make arrangements to have someone do whatever cleaning was necessary. By that I mean that if your volume of business at the present moment does not warrant a porter, then hire a woman to come in an hour or so a day, or whatever is necessary, but whatever you do, don't economize on cleaning.

"Straighten up the shelves in your accessory store. Don't toss your stock around. Pile it neatly. Furthermore, to produce the best impression on the eye put articles of the same general shape and size on the same shelves.

Care in Dressing Showcases

"Use just as great care in dressing your showcases as your windows, and in both cases don't make the mistake of crowding too much in. Too little is better than too much. And remember that in both cases it is necessary to change the display at least once a week.

"Something should be done to the floor. The bare floor gives the store a crude appearance. Paint it or varnish it, lay linoleum, cork composition, tile or whatever suits your taste and pocketbook, but do something with it.

"Get rid of the roll-top desk in your office. It obstructs the light and is one of the best little trick boxes for losing important papers ever invented. It is piled so high with correspondence that it not only looks like the dickens, but it takes an hour to find anything when you do want it. I am speaking from sad experience. Buy a letter file, get a new desk or at least pull the roller top off of the one you have, rearrange the furniture so that it will be more convenient, see that the office is lighted adequately and keep it clean.

"Whitewash the garage, or better still, use a cold water paint. Clean the windows and keep the floor scrupulously clean.

"Neatness and order must prevail in the shop. Litter must be kept off of the floor, and it must be thoroughly cleaned every day. There should be boxes, benches, shelves and racks for tools and parts and a place for everything, but above everything else keep things off of the floor, for a clean floor means a neat shop. I haven't got time to tell you all the advantages I have found resulting from a neat shop, but sit down sometime and see how many you can think of in the course of an hour. It will be time well spent and will convince you of the necessity of keeping the shop shipshape.

"Now that I have told you briefly what I think is the main reason your business isn't more flourishing, let's go back and consider why these things are so necessary. Did you ever stop to consider why a man comes in the first time? Of course it may be because your place happens to be handy or because your place seems no better nor worse than the rest—then it's a toss-up. Probably these are the reasons that you have what trade you now possess. Let us assume that a motorist wants to buy something—he may be either permanent or transient—and that he is uncertain where to go. He sees your garage. If the purchase is urgent or unimportant, the purchase of gasoline might be both, he may stop whether he is favorably impressed with the appearance of your business or not. Also he may stop if the other available places are just as unprepossessing as yours.

Customer Will Go By Dirt

However, if the purchase is not important and not urgent, the chances are nine to ten he will drive by if he does not like the looks of your place. If he lives in the neighborhood he may drive by indefinitely. Why? Because he dislikes dirt and untidiness, preferring neatness and cleanliness for the same reasons that he is neat and clean about his person; his home and his office; for the same reasons that he drives a good-looking, frequently washed and polished car. It is his nature to prefer these things, and he picks and chooses accordingly without perhaps giving it much thought.

"But, if he does think about it you can be sure his conclusion is that neatness and cleanliness go with good workmanship and good business methods, and generally he is right. You know this from your own experience. How often

Swiss Has New Car

PICCARD-PICTET, the leading Swiss manufacturer, has got into production on a new 32-hp. eight-cylinder, valveless car. The engine has a bore and stroke of 85 to 130 mm., approximately 2.16 by 3.3-in. The cylinders are mounted at an angle of 60 deg. with the carbureter and all such accessories as magneto and dynamo placed within the angle. Among the features of the car are: Forced feed lubrication with all the oil contained in a dashboard tank, the sump being dry. Front wheel brakes are fitted in addition to brakes on the rear wheels and on the transmission. The radiator fan is gear driven. Every known accessory is supplied as a standard part of the equipment of this chassis.

Electric lighting and starting has been adopted, the starting crank having been abolished altogether. There is a tire pump driven from the gearbox. On the dashboard is an eight-day clock, speedometer, revolution counter, oil pressure and oil level indicator and electrical instruments. All metal parts are nickel-plated. Grease cups have been abolished throughout the chassis in favor of oil lubricators.

have you thought to yourself, 'So-and-so does not amount to very much. His shoes are run over and his collar is dirty?' If this applies to a person, how much more does it apply to a business?

"On the other hand, suppose that your place is as neat, clean and attractive as your earnest effort can make it. A prospective customer passes and says to himself, 'that looks like a good garage; it has an up-to-date appearance; I'll have to stop there first time I want something.'

"You've sold your business to him just on its face value. You can't sell him a thing until he stops, so until that time the only sales argument worth while is the appearance of your place. So you can sell him your business optically if its appearance is pleasing. That's what I meant by love at first sight.

"You may get a new customer as far as your front door, due to advertising, circularizing or personal recommendation, but it's pretty hard to pull him over the threshold unless he likes the looks of your business place. Many other people pass your place every day by chance, both local people and tourists, and whether they stop when they want things or not depends almost entirely on its looks.

Your Best Advertisement

"In other words the appearance of your place is your best advertisement. You might have a hundred signboards or billboards or spend oodles of money in the newspapers, but your biggest ad is the good appearance of your place of business. You can paint nice pictures on billboards or put nice phrases in the newspapers, but what are these compared to the impression the real, full-size appearance of a building, neat and attractive, make? In comparison all other forms of advertising, although necessary, are imitation. If it makes the impression any more vivid, call your building a mammoth signboard and treat it accordingly.

"Having created a favorable first impression on the prospect, be sure that he is not disappointed when he does make his initial visit, or any visit for that matter. Hence the necessity for keeping the interior neat and clean and having all your help the same way. One of the very largest garages, and most successful, needless to add, insists on every employee, from the highest to the lowest, having his shoes shined when he comes to work. I've tried it and, believe me, it pays.

After Appearance Experience

"If practical experience bears out the customer's ocular expectations, he will remain a customer.

"You will have to be satisfied with livery stable profits as long as your business has a livery stable look, but make it appeal to the eye and you won't be able to keep new customers from flocking to you, more especially because neat, clean, attractive garages are all too uncommon."

Garage Planning

Service Station Arrangements

No. 83

Office and Stockroom Layout

Q—Would like your suggestions as to how I could best arrange an office and stockroom in my garage. You can see how I have them at present from the attached drawing, but I prefer to have the office next to the window on the ground floor, where the stockroom is now, with the stockroom adjoining the office in the same location.

Would like, if you think best, to have the stockroom so I could lock it up and would also like you to show the best way to arrange the stock. I carry about \$3,000 in casings, about 150 tubes, about \$2,000 in Ford parts, about \$1,500 in accessories, about \$550 in electrical goods, such as generator brushes, distributor arms, etc.—R. W. Miller, Brazos Valley Garage, Hearne, Tex.

As the space you contemplate giving to your stock and office is so limited, and as your doors and aisles are so spacious, we believe it would be a good plan to have your accessory showcase and parts counter directly on the aisle, built into the partition in such a way that a vertically sliding counterbalanced door could be lowered and locked down at night. Then with door B locked access could not be had to the stockroom.

Case A should be ornamental, with glass doors to display the accessories, but the parts stockbins need be only rough pineboards. Tires are stored on rack above the parts bins, which are not excessively high. Our garage plan No. 72, issue of June 26, shows and describes a method of building bins which ought to fit your requirements, as also does the July 24 issue.

An accessory display window on the main highway ought to bring in some sales though it takes up considerable space and may not be possible. It would not be necessary to have it in conjunction with the salesroom. It might be located in the windows at the northeast corner near the vulcanizing room. At any rate, a display somewhere both of

MOTOR AGE is receiving many inquiries for garage plans which do not give sufficient information to permit an intelligent reply. There are certain things which should be known to lay out the proper plan for a garage, and inquiries are urged in asking for such plans to be sure to include the following information:

Rough pencil sketch showing size and shape of plot and its relation to streets and alleys.

What departments are to be operated and how large it is expected they will be.

Number of cars on the sales floor.

Number of cars it is expected to garage.

Number of men employed in repair shop.

And how much of an accessory department is anticipated.

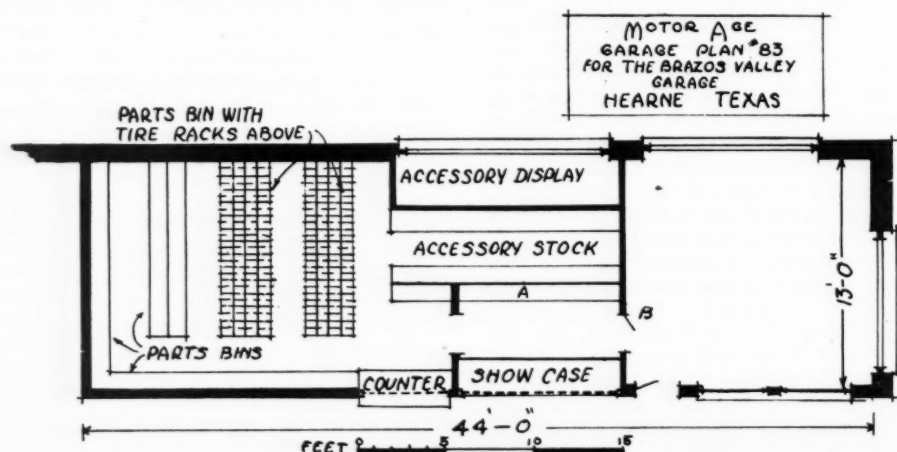
parts and accessories is very desirable and should be arranged for.

No. 84

Building 70 by 100 Ft.

Q—Make suggestion for a building 70 by 100 ft. with 25-ft. workshop at rear, display room for four or five cars, accessory, parts room and office and private office. Also women's restroom. The building will face the north with alley on the east, both street and alley paved. Would prefer the restroom in the northeast corner. I want it to have a front entrance for cars and want cars to exit at side in alley.—J. E. Frazier, Pratt, Kan.

There have been several plans in

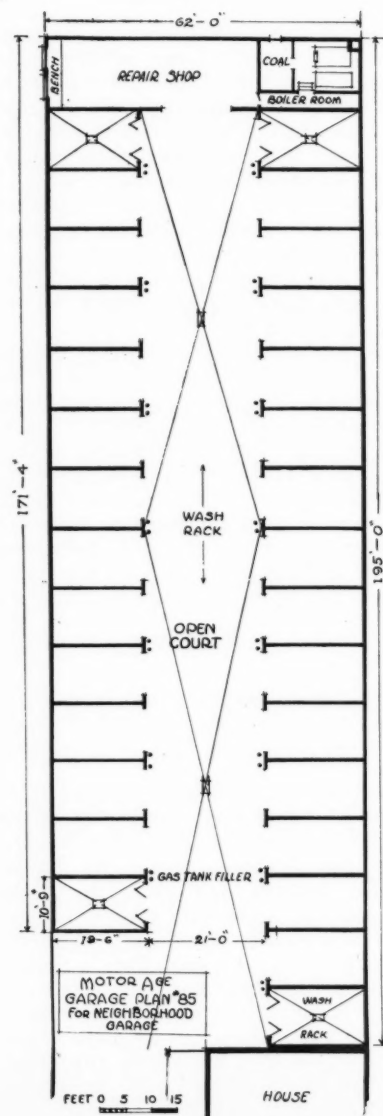


Arrangement for office and stockroom planned for Brazos Valley Garage

MOTOR AGE which would almost fit your case, and it might be to your advantage to look over your back numbers for further suggestions.

We have cut down the width of the repairshop to 23 ft. to give greater width to the showroom and office section and still leave 48 ft. for an aisle and double row of cars.

It will be practically impossible to display five cars in the showroom without cutting out the offices and women's room or cutting down the garage space considerably. You have not stated the nature of your business, and we are somewhat in doubt. Four or five cars seem to us quite a number to display in a building of this size, if you have a general



Plan for Neighborhood Garage

garage. If you only have sales and service, then we would say leave only enough space in the center for one row of cars and an aisle dividing the other 16 ft. between the showroom and shop. Or cut out the front entrance entirely, increasing the showroom space by 11 ft. and the garage by two cars. The latter suggestion would not be good if you are transients, as in that case an attractive and convenient entrance is not only desirable but necessary.

No. 85

Garages for Rent to Owners

Q—Can you suggest any way to build several individual one-car garages to be rented to people in the neighborhood? Garages are very hard to obtain here, and a good rate of rental prevails. I think if a satisfactory plan could be found that would not entail an excessive investment I would be tempted to take a chance.—Neighborhood Garage.

MOTOR AGE is of the opinion that this venture should pay well. There need be practically no overhead, except of a small amount of light, heat and water, and even these could be charged for extra. The labor hardly would take all one man's time. While we have not investigated the financial end of the proposition, there are several garages of this type in operation in Chicago, a plan of one of which we show.

We do not know the nature of the property on which you contemplate building, but the one we show is on the rear of an old-style deep lot 62 ft. wide, the front of which is occupied by a large old house that could not be considered a paying investment at present but was at one time a beautiful home.

As shown in the plan the individual garages are about 10 ft. 9 in. wide by 18 ft. 6 in. deep, just large enough for any large car. They are arranged on both sides of a court 21 ft. wide. Garages and court all have a continuous concrete floor which is well drained and can be used for washing purposes anywhere. A common repairshop is located at the end

of the court, where tenants may do their own light repairing, using, of course, their own tools, nothing but a bench and vise being furnished.

Each garage is supplied with water, electric light, a small heating coil and gasoline tank underground with filler outside and pump inside. The doors open in so they will not obstruct the court but are divided so that they only swing back 2 ft. inside the garages.

This arrangement is very economical of space, much more so than if only one row were built. Perhaps you could build a small section of this sort corresponding to the rear end of this plan, and if you found it was a paying venture continue it as far as your ground would permit.

MILWAUKEE GETS SOME CARS

Milwaukee, Wis., July 24—Improvement in deliveries of cars has become noticeable to a slight but encouraging extent and distributors as well as dealers are beginning to feel that material relief from the acute shortage of cars is about to come. The demand for cars continues to be the most active ever known, despite high prices and war taxes.

The announcement made in the last week or ten days by several leading manufacturers of their 1920 lines and the general knowledge that is coming forward about future values being in the ascendancy rather than on the decline, has brought many people into the market who had been holding off because of a belief that lists would undergo a material reduction after July 1.

While dealers in general report increased deliveries, complaint is heard that production has not yet reached the point where it becomes possible to effect any sort of an accumulation of stocks. The cars now being received are applied largely on back order and new customers are compelled to wait in many cases almost as long as those who are just getting their cars.

Truck dealers report an excellent de-

mand since the annual torrid season has again awakened the consciousness of operators of horse-drawn hauling equipment to the humanitarianism and economy of the commercial vehicle.

Tractor business is in its usual mid-summer slack period, this being the season when farmers are busier than at any other time of the year with the harvest. Nevertheless, some good sales are being made right along and some excellent prospects are being created for business early in the fall, when immediate use for plowing will be in order.

HARTFORD DEALERS ON OUTING

Hartford, Conn., July 24—The Hartford Automobile Dealers' Association, Inc., passed up business this week for an outing down the Connecticut river and along Long Island sound. S. A. Miner, Pierce-Arrow distributor, was commodore, and issued sealed orders. The dealers cruised down the river in motor boats, stopping for refreshments at Essex. The run later was resumed and continued across Long Island sound to New London, where a stop was made for the night. The next day the dealers cruised over to Niantic bay and called on Host Manwarring at the Oswegatchie House, where a sumptuous dinner was had.

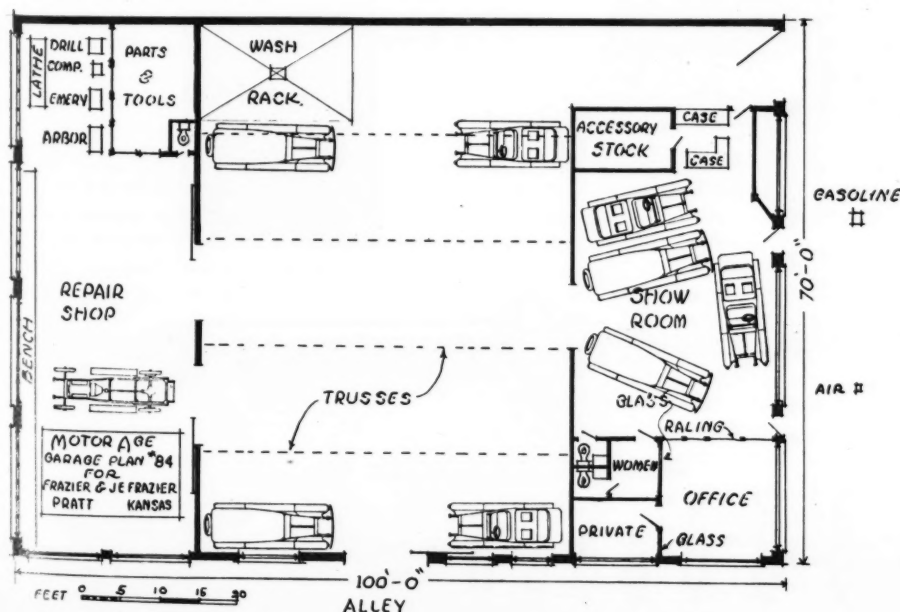
The older members in fancy tripped back to younger days and gave a demonstration of what dancing used to be. L. H. Elmer, Ford distributor, conducted the orchestra to the satisfaction of all concerned. The next day the party started for home. David B. Roberts, Buick distributor, entertained the dealers at his farm.

The dealers were advised against talking business under penalty of fine. No one was fined. Russell P. Taber, Reo, Republic and Peerless distributor, won general approval by reason of his ability to cook, in fact, his aptitude in this direction was compared with his ability to make sales. L. H. Elmer was the only member to get seasick, although he showed marked ability and speed as a swimmer. The dealers voted it the best time they ever held. Charles O. Britton, president of the association, presided over the gathering, assisted by Ben F. Smith, show manager.

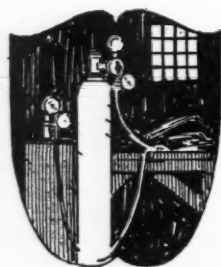
ST. LOUIS LIFTS GARAGE BAN

St. Louis, Mo., July 24—Garages may be operated in the downtown district of St. Louis east of Twelfth street after Aug. 9. The lifting of this ban is one of the features of the new parking ordinance, which becomes effective then and which prohibits the parking of cars in this congested district longer than an hour. The time limit is now 2 hr.

The ordinance provides that fireproof garages of any height not prohibited by the building-zone law may be erected in the downtown district, and garages not exceeding one story in height may be maintained without being fireproof. A law also has been passed regulating watchmen for motor cars, so that there may be responsible guards for cars parked just outside the congested district.



This garage plan was made for J. E. Frazier



Autogenous Welding in Automotive Repairs

By Thomas P. Bowman



This is the sixth installment of a series of articles that are to be published in MOTOR AGE each week. The author has had practical experience in motor car repairshops which enables him to present first-hand information on practical welding in a clear and concise manner. No difficulty should be encountered in this work, provided the reader will apply all the methods given herein.—Editor.

Part VI—The Acetylene Generator

It is not possible to compress acetylene at a high pressure into an empty tank as is done with oxygen. This is because acetylene at a high pressure will explode. For this reason a different style of tank is used. Inside the tank is placed a material that is porous. This material is soaked in a liquid called acetone. Acetylene will be dissolved in this liquid just like sugar is dissolved in water. When acetylene is pumped into a tank of this kind it is safe. It is never pumped up to a pressure over 250 lb. The usual tank of acetylene contains 300 cu. ft. of gas.

No blowpipe that will empty it in less than 7 hr. should be used on an acetylene tank. If the tank is emptied in a shorter time than this, the liquid will be drawn out of the tank. Do not drop or jar any acetylene cylinder. Handle it carefully. Always keep an acetylene cylinder in as cool a place as possible. Do not stand it near a fire. If possible, it should be kept out of the hot sun.

Before connecting an acetylene regulator to a tank be sure that the cylinder valve is operating properly and that there is

no leakage around the nut of the stem. Because acetylene is inflammable, all leaks in the cylinder valve, hose and connections should be avoided. If a cap is supplied for the tank valve, always see that this is in place before moving the cylinder. Do not transfer acetylene from the cylinder to an empty tank. Avoid large volumes of acetylene under pressure. Acetylene will act on pure copper so that it will produce an explosive compound. Because of this never use copper in acetylene equipment. Brass or bronze, however, can be used safely.

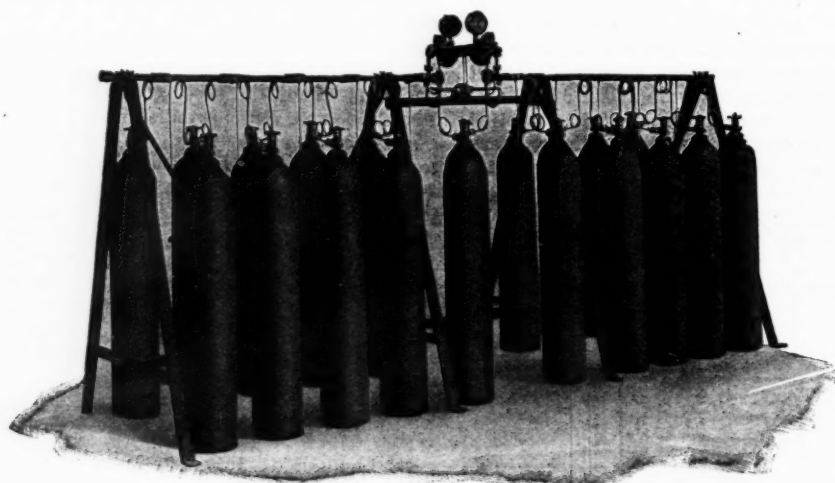


Fig. 18—An oxygen manifold installation

Fig. 19—At the right is an acetylene chamber. It is completely filled with a porous substance

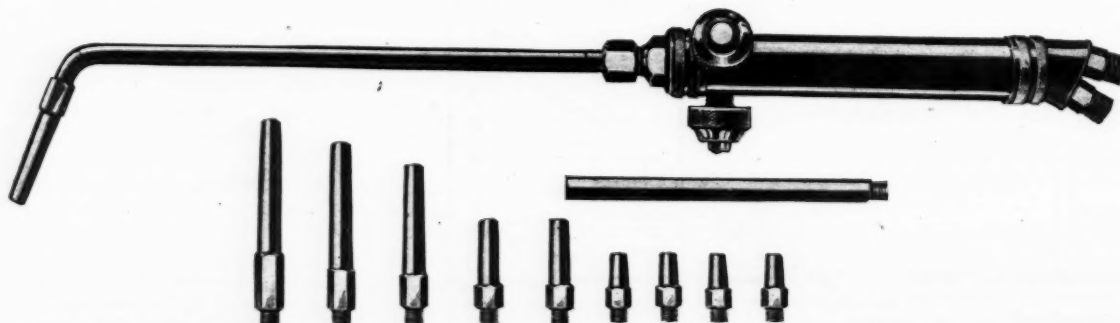
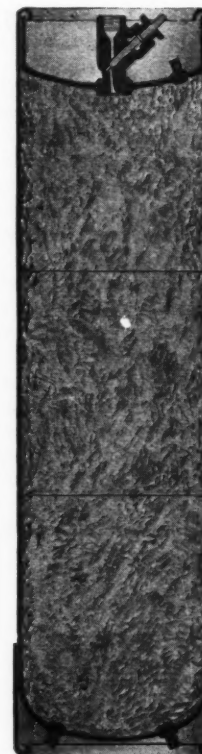


Fig. 20—Welding torch with interchangeable tips. The mixing chamber is just in front of the torch handle

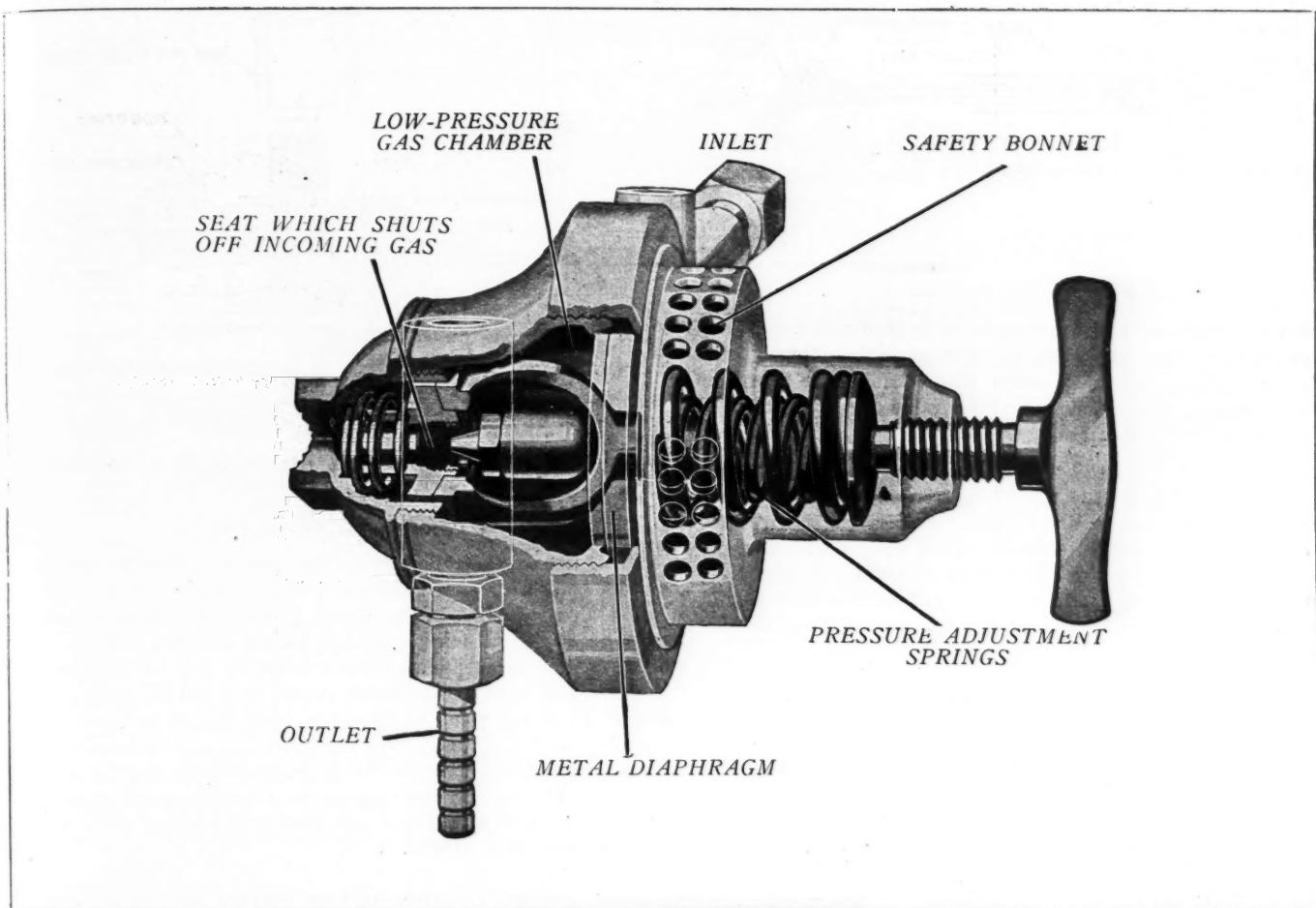


Fig. 21—Phantom view of regulator, showing internal parts

Never use acetylene at any time at a pressure above 15 lb. Beyond this it is dangerous. Do not attempt to locate a leak in the acetylene connections with an open flame. To locate a leak use soap and water with a brush. When the leak is located, bubbles will appear.

Due to the fact that acetylene is not compressed in an empty tank like oxygen but is dissolved in a liquid, it is not possible to determine the amount of acetylene being used by the gage readings. This may be determined, however, by weighing the tank before and after the job. There is $14\frac{1}{2}$ cu. ft. of acetylene to a pound.

REGULATOR OR REDUCING VALVE

A regulator, or reducing valve, is used in an oxacetylene unit to reduce the pressure of the gas and to keep this pressure constant, or even. Fig. 21 shows a view of one type of regulator. The regulator is a delicate device, very sensitive, and must be handled very carefully. Never drop or jar it. Do not use oil, grease or such material for lubrication in connection with the oxygen regulator. Keep as much dust and dirt out of it as possible by inserting the dust plug when the regulator is not in service. Do not change the regulator from one cylin-

der to another without taking the pressure off the diaphragm, which can be done by turning the handle to the left. A regulator should not be repaired by any but skilled workmen. Do not replace diaphragm, valve seats, springs or other wearing parts except with those actually manufactured for the regulator.

WELDING BLOWPIPE

Fig. 20 represents a welding blowpipe. The blowpipe is the instrument used for welding. It is designed to be easy of control and manipulation. It consists of a tubular handle, in one end of which is a valve body carrying both the oxygen and acetylene valves. On the other end is a head into which is inserted welding heads or tips of different sizes. The mixture of gases occurs in these tips. If the blowpipe is handled, it should not require a great amount of attention. It should only be necessary to clean the removable and working parts and occasionally, the tips and passages of the welding heads.

The tips never should be cleaned with anything but a soft copper or brass wire. If something harder is used, the hole will become larger and the head will not work so well. Occasionally dirt can be blown out of the head by high oxygen pressure. If the flame is not adjusted properly, or the tip becomes clogged, the blowpipe may backfire. When this occurs close the acetylene valve for a few seconds. Then open this valve fully and relight the blowpipe. If the backfire continues, close both the acetylene and oxygen valves, then relight the blowpipe. If the blowpipe becomes heated, it may be cooled by plunging it into a bucket of water. When this is done be sure that the acetylene has been shut off and a small quantity of oxygen is passing through the blowpipe.

The blowpipe may be cleaned by removing both the acetylene and the oxygen hose and then connecting the tip of the head to the oxygen hose. Then turn on about 20 lb. of oxygen



Fig. 22—Typical welding goggles

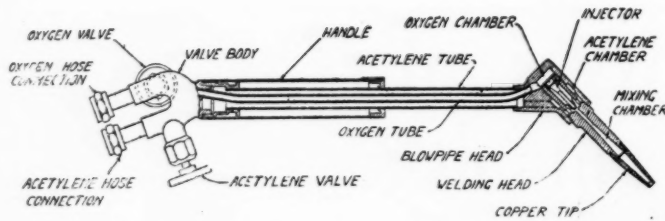


Fig. 23—Cross-section of welding blowpipe

pressure. The acetylene valve must be opened and the oxygen valve closed. This will drive any dirt or carbon through the larger acetylene passages. After this is done the acetylene valve should be closed and the oxygen valve opened. This will clean out the oxygen passages.

HOSE

Two colors of hose are used, black for acetylene and red for oxygen. This is to prevent interchanging when connecting the apparatus. All hose connections must be tight. A good hose clamp should be used. Both acetylene and oxygen hose should be blown out occasionally so that dirt and dust will not be carried into the blowpipe.

WELDING HEADS

Ten sizes of welding heads are supplied with a blowpipe. Each of these heads gives a certain size of flame. Each of these flames is to be used on different thicknesses of metal, as is shown by the table in the first article of this series. The acetylene pressure for all heads is the same, namely, 1 lb. The

CLOSED CAR DEMAND CONTINUES

Milwaukee, Wis., July 28—Improvement in the car supply is indicated by the arrival of a few trainload shipments and the promise that from now on deliveries will be facilitated in every way possible, according to leading local dealers, who discern much that is encouraging in the situation as August approaches. The strenuous effort of manufacturers to meet the overwhelming requests of dealers seem to be beginning to have effect. It will, however, require a great deal more improvement before all demands have been met and the army of new car buyers satisfied.

Closed cars never before were wanted so much and in such large numbers as now, despite the fact that the hottest weather of the year has been the rule for several weeks. In general, local dealers have almost twice as many orders for closed models than they can hope to get before Jan. 1. The climate of Milwaukee and Wisconsin is such that closed cars are ideal both for winter and summer use and if the cars were available, many would be taken by people who have to be satisfied with open models and under present conditions are mighty glad to get even those.

SKILLED DRIVERS SAVE TRUCKS

Atlanta, Ga., July 25—The Pioneer Motor Express, operating daily motor express service between Atlanta and Griffin, Ga., with 2-ton trucks, reports great savings in maintenance cost by employing skilled mechanics as drivers. The wage of the mechanic is twice that of an

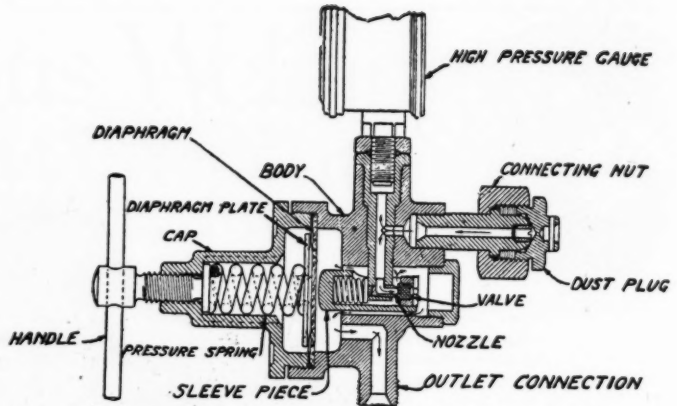


Fig. 24—Cross-section of regulator

oxygen pressure varies, ranging from 9 to 30 lb., according to the size of the head.

OXY-ACETYLENE FLAME

When the oxy-acetylene flame has just the right proportion of each gas, it is called neutral. This is shown by a clearly defined central cone, bright bluish green in color, surrounded by a bushy, weak flame, purplish yellow in color. When too much oxygen is used, this central cone, or jet, becomes bluer in color and loses the greenish tinge; it is not so clearly defined. When too much acetylene is used, the jet becomes bluish white and is streaky. The neutral flame should be used always. One should test his flame from time to time as he is welding. This is done by turning on a slight excess of acetylene by the acetylene valve and then trimming it down so a neutral flame is produced.

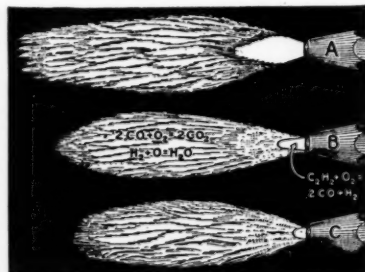


Fig. 25—Oxy-acetylene flame

ordinary driver, but the saving attained by keeping the trucks in continual operation and eliminating service charges for minor repairs and adjustments more than justifies the additional wage. These trucks make a return trip daily covering a distance of 90 miles, and as there are no completely equipped service stations between the two points much depends upon the ability of the driver.

TRUCK TIRES MUST BE RUBBER

New Orleans, La., July 25.—Truck owners have ninety days from July 23 in which to change all their steel tires to rubber, according to an ordinance adopted by the city commission council on that date. Draymen, who protested the ordinance when it was first proposed some three months ago, have equipped virtually all their trucks with rubber tires, but now the lumbermen have entered protest, claiming that it will cost them thousands of dollars to equip their trucks and trailers with rubber tires.

HOW TEXAS TRUCK DEALERS SELL

San Antonio, Tex., July 25—Going into the trade territories with a fleet of trucks, maintaining schedules of operation and hauling freight free of charge to intermediate points in the territorial radius of San Antonio, is the latest movement by truck dealers here to demonstrate truck values and to increase their use.

The program provides for a series of truck excursions and rural parades, with each dealer contributing one or more trucks. There will be regular weekly truck trips and on these days merchandise and products of the farmers will be carried to and from shipping centers free of charge, the idea being to show how the truck can operate as a transportation medium keep its schedules and discount the railroads competitively on the short haul routes.

A systematic advertising campaign in advance of each of these trips to create popular interest and brings crowds out in the small towns and along given points on the routes, will be launched. The service of the Firestone ship-by-truck bureau will be given the dealers in carrying out this practical method of truck demonstration.

More than fifty truck operators in addition to manufacturing and jobbing industries in San Antonio have become members of the ship-by-truck bureau of the Firestone branch. This is the first organized effort in the Southwest of Texas to prove the truck as an indispensable facility for transportation.

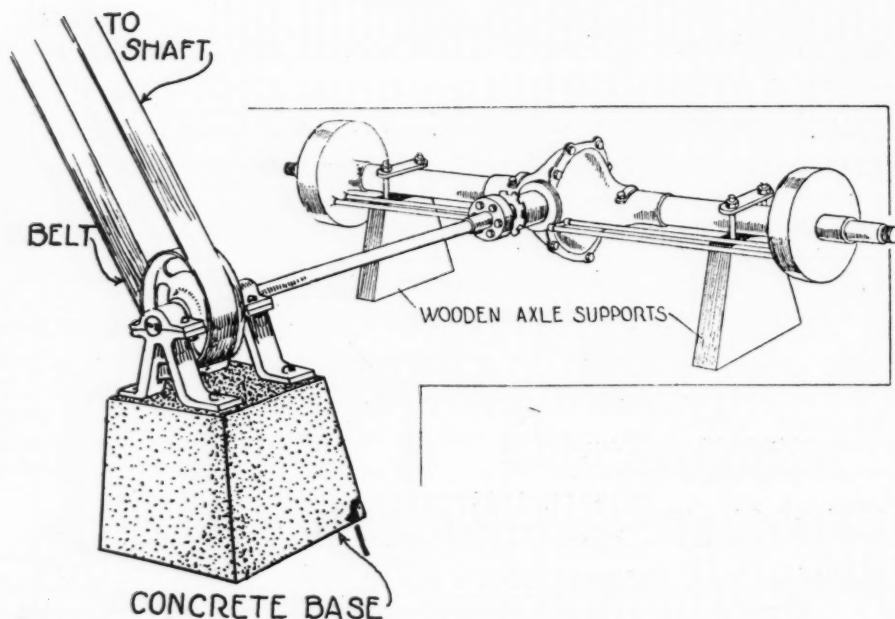
Motor Age Monthly Farm-Lighting Specification Tables

Name and Model	Maker	Watts	No. 20 lamps	Lamp voltages	No. w/v's	Make of engine	Horsepower	Fuel	Cooling	Power Pulley	Generator Drive	Make of generator	Make of battery	Battery amp. hours	Battery volt.	No. cells	Starting engine	Stopping engine	Governor	Price
Aerothrust	Aerothrust Engine Co., La. Porte, Ind.	1000	15-25	40	12	Idle	3	...	Air	Opt.	Shaft	GE Alco	Willard	60	28-42	16	Auto.	Auto.	Throttle	\$ 375
Alamo	Alamo Farm Light Co., Omaha, Neb.	1000	75-120	110	4	Alco	2	...	Water	Opt.	Direct	GE Alco	Willard	76	6	3	S. Auto.	Auto.	Electro sole.	450
Alco	Automatic Light Co., Minneapolis, Minn.	850	55-75	32	4	Alco	2	...	Water	Opt.	Direct	Imperial	Willard	80	32	16	S. Auto.	S. Auto.	Throttle	425-460
Cushman, A.	Cushman Motor Works, Lincoln, Neb.	1000	20-70	32	4	Ovn	4	...	Water	Yes	Belt	Imperial	Exide	120	32	16	S. Auto.	S. Auto.	Throttle	425-460
Cushman, B.	Cushman Motor Works, Lincoln, Neb.	1000	25-75	32	4	Ovn	4	...	Water	Yes	Belt	Imperial	Exide	180	32	16	S. Auto.	S. Auto.	Throttle	425-460
Delco, 3 KW.	Domestic Engineering Co., Dayton, Ohio.	1000	50-100	32	4	Ovn	4	...	Water	Yes	Belt	Imperial	Exide	80-160	32	16	S. Auto.	S. Auto.	Voltage	900
Delco, 3 KW.	Domestic Engineering Co., Dayton, Ohio.	1000	20-72	32	4	Ovn	4	...	Water	Yes	Belt	Imperial	Exide	80-160	112	36	S. Auto.	S. Auto.	Voltage	1200
Dyneto, 5	Dyneto Electric Co., Syracuse, N. Y.	3000	150	110	4	Ovn	1 1/2	...	Water	Opt.	Direct	Ovn	Willard	53	32	16	S. Auto.	S. Auto.	Throttle	385
Dyneto, 7	Dyneto Electric Co., Syracuse, N. Y.	3000	20-42	32	4	Ovn	1 1/2	...	Water	Opt.	Direct	Ovn	Willard	80	32	16	S. Auto.	S. Auto.	Throttle	410
Fairbanks-Morse, F-3 hp.	Fairbanks, Morse & Co., Chicago.	900	13-100	30	4	Ovn	3	...	Water	Opt.	Belt	Ovn	Willard	160	32	16	S. Auto.	S. Auto.	Throttle	460
Fairbanks-Morse, F-6 hp.	Fairbanks, Morse & Co., Chicago.	3500	40-200	30	4	Ovn	6	...	Water	Opt.	Belt	Ovn	Willard	160	32	16	S. Auto.	S. Auto.	Throttle	460
Fairmont, B-4	Fairmont Gas E. & R. M. Co., Fairmont, Minn.	600	50	32	1	Ovn	4	...	Water	Yes	Belt	W. E.	Edison	200	32	24	S. Auto.	Manual	Throttle	595
Garford	Garford Mfg. Co., Elyria, Ohio.	1000	16-62	30	4	Ovn	2	...	Water	Yes	Belt	W. E.	Edison	80	32	11	S. Auto.	Manual	Throttle	320
Genco, A.	General Gas-Electric Co., Hanover, Pa.	1000	22-73	32	4	Ovn	2 1/2	...	Water	Yes	Direct	Ovn	Edison	110	32	16	S. Auto.	Auto.	Throttle	495
Genco, B.	General Gas-Electric Co., Hanover, Pa.	1000	38-87	32	4	Ovn	2 1/2	...	Water	Yes	Direct	Ovn	Edison	167	32	16	S. Auto.	Auto.	Throttle	495
Jones, A.	L. B. Jones Co., Kansas City, Mo.	750	40	32	1	Ovn	1 1/2	...	Water	Opt.	Direct	Ovn	Willard	115	32	16	Manual	Manual	Throttle	495
Lalloy	Lalloy Electro-Lighting Co., Detroit.	1000	75-30	30	4	Ovn	1 1/2	...	Water	Opt.	Direct	Ovn	Edison	38	50	26	Manual	Manual	Throttle	495
Lauson-Edison	John Lauson Mfg. Co., New Holstein, Wis.	800	75-75	50	4	Ovn	1 1/2	...	Water	Opt.	Belt	Ovn	Edison	75	52	26	Manual	Manual	Throttle	495
Lauson Junior, 301	Lauson Mfg. Co., Appleton, Wis.	1000	25-154	125	4	Ovn	4	...	Water	Opt.	Belt	Ovn	Edison	112	52	26	Manual	Manual	Throttle	495
Langstadt-Meyer, 6 1/2	Langstadt-Meyer Co., Appleton, Wis.	1000	10-25	30	4	Ovn	1 1/2	...	Water	Opt.	Belt	Ovn	Edison	40	30	15	Manual	Manual	Throttle	495
Main, 25-30 volt.	Main Electric Mfg. Co., Pittsburgh, Pa.	1200	75	32	4	Ovn	3	...	Water	Opt.	Belt	Ovn	Edison	60	30	15	Manual	Manual	Throttle	495
Marco	Marmon-Chicago Co., Chicago.	1250	85-100	32	4	Ovn	3 1/2	...	Water	Opt.	Belt	Ovn	Edison	107	32	16	S. Auto.	Manual	Throttle	576
Mathews, A-1	Mathews Engineering Co., Sandusky, Ohio.	1000	50	32	4	Ovn	3	...	Water	Opt.	Belt	Ovn	Edison	80	32	16	S. Auto.	Manual	Throttle	600
Mathews, B-1	Mathews Engineering Co., Sandusky, Ohio.	1000	50	32	4	Ovn	3	...	Water	Opt.	Belt	Ovn	Edison	80	32	16	S. Auto.	Manual	Throttle	600
Mathews, C	Mathews Engineering Co., Sandusky, Ohio.	1000	50	32	4	Ovn	3	...	Water	Opt.	Belt	Ovn	Edison	80	32	16	S. Auto.	Manual	Throttle	600
Mayhew, K 1	Mayhew Co., Milwaukee, Wis.	800	12-40	32	4	Ovn	3	...	Water	Opt.	Belt	Ovn	Edison	80	32	16	S. Auto.	Auto.	Electro-mag.	600
Mayhew, K 2	Mayhew Co., Milwaukee, Wis.	800	12-40	32	4	Ovn	3	...	Water	Opt.	Belt	Ovn	Edison	80	32	16	S. Auto.	Auto.	Electro-mag.	600
Mayhew, K 3	Mayhew Co., Milwaukee, Wis.	800	12-40	32	4	Ovn	3	...	Water	Opt.	Belt	Ovn	Edison	80	32	16	S. Auto.	Auto.	Electro-mag.	600
Mor-Lite	Mor-Lite, Morris & Co., Chicago.	1250	10	32	4	Ovn	3	...	Water	Opt.	Belt	Ovn	Edison	80	32	16	S. Auto.	Auto.	Electro-mag.	600
Perfection	Perfection Storage Battery Co., Chicago.	1500	75	32	4	Ovn	7	...	Water	Opt.	Belt	Ovn	Edison	144	32	16	S. Auto.	Auto.	Electro-mag.	1350
Powerlite	Powerlite, 103 L. 65.	1500	20	32	4	Ovn	7	...	Water	Opt.	Belt	Ovn	Edison	144	32	16	S. Auto.	Auto.	Electro-mag.	1350
Powerlite	Powerlite, 103 L. 65.	1500	20	32	4	Ovn	7	...	Water	Opt.	Belt	Ovn	Edison	144	32	16	S. Auto.	Auto.	Electro-mag.	1350
Robaco, Unit	Roberts-Hamilton Co., Minneapolis, Minn.	1500	41	32	4	Ovn	7	...	Water	Opt.	Belt	Ovn	Edison	144	32	16	S. Auto.	Auto.	Electro-mag.	1350
Robaco, BE-1	Roberts-Hamilton Co., Minneapolis, Minn.	1500	41	32	4	Ovn	7	...	Water	Opt.	Belt	Ovn	Edison	144	32	16	S. Auto.	Auto.	Electro-mag.	1350
Robaco, BE-2	Roberts-Hamilton Co., Minneapolis, Minn.	1500	41	32	4	Ovn	7	...	Water	Opt.	Belt	Ovn	Edison	144	32	16	S. Auto.	Auto.	Electro-mag.	1350
Robaco, BE-3	Roberts-Hamilton Co., Minneapolis, Minn.	1500	41	32	4	Ovn	7	...	Water	Opt.	Belt	Ovn	Edison	144	32	16	S. Auto.	Auto.	Electro-mag.	1350
Swanlite	Swartz Electric Co., Indianapolis, Ind.	1000	50-100	30	4	Ovn	3	...	Water	Opt.	Belt	Ovn	Edison	80	32	16	S. Auto.	Auto.	Electro-mag.	600
Swartz-Unit	Swartz Electric Co., Indianapolis, Ind.	1000	50	30	4	Ovn	3	...	Water	Opt.	Belt	Ovn	Edison	80	32	16	S. Auto.	Auto.	Electro-mag.	600
Syco	Beaudette & Graham Eng. Co., Boston, Mass.	1000	62-70	32	4	Ovn	3	...	Water	Opt.	Belt	Ovn	Edison	80	32	16	S. Auto.	Auto.	Electro-mag.	600
Uni-Lectric	Uni-Lectric Corp., Detroit.	1000	150	32	4	Ovn	3	...	Water	Opt.	Belt	Ovn	Edison	80	32	16	S. Auto.	Auto.	Electro-mag.	600
Universal, 4-KW	Universal Products Co., Oshkosh, Wis.	4000	200	32	4	Ovn	8	...	Water	Opt.	Belt	Ovn	Edison	80	32	16	S. Auto.	Auto.	Electro-mag.	600
West, Elect., 15-DC-180	Western Electric Co., New York.	1500	75	32	4	Ovn	3 1/2	...	Water	Opt.	Belt	Ovn	Edison	80	32	16	S. Auto.	Auto.	Electro-mag.	600
Willis Light	Electric Auto-Lite Corp., Toledo, Ohio.	5000	250	115	4	Ovn	1 1/2	...	Water	Opt.	Belt	Ovn	Edison	80	32	16	S. Auto.	Auto.	Electro-mag.	600
Winton	Winton Engine Works, Cleveland, Ohio.	5000	250	115	4	Ovn	1 1/2	...	Water	Opt.	Belt	Ovn	Edison	80	32	16	S. Auto.	Auto.	Electro-mag.	600
Wisconsin	Lauson-Lawton Co., De Pere, Wis.	800	40	32	4	Ovn	3	...	Water	Opt.	Belt	Ovn	Edison	80	32	16	S. Auto.	Auto.	Electro-mag.	600
100-light	100-light	800	40	32	4	Ovn	3	...	Water	Opt.	Belt	Ovn	Edison	80	32	16	S. Auto.	Auto.	Electro-mag.	600

*Without engine. Opt., optional. S-Auto, semi-automatic. K, kerosene. G, gasoline. Electro-mag., electro-magnetic.

The Motor Car Repair Shop

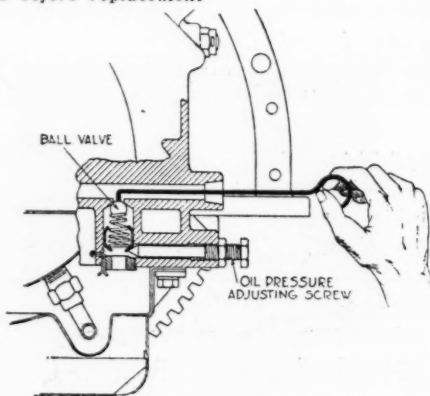
Practical Maintenance Hints



How axle can be adjusted before replacement

Low Oil Pressure

WHEN the oil pressure on the high-pressure system refuses to come up to its maximum amount, generally about 25 lb., it is probable the ball check valve is clogged with dirt. This can be removed very quickly with the aid of a piece of bent wire. Remove the oil line from the pump and snap the ball check valve up and down several times with the bent wire as shown in the illustration. The wire hook should be made from a 3/16-in. rod with a 3/8-in. hook at the end bent at right angles. It is used as shown herewith.



Using bent wire to clean valve

Rear Axle Adjustment

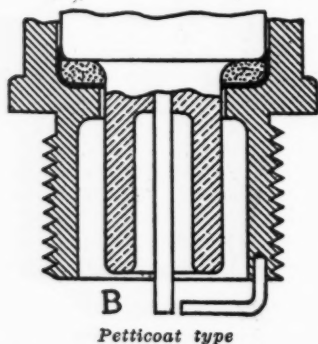
If the rear axle of a car come off for repairs, then it is generally necessary to readjust the axle before replacement. This can be done very easily if the following method is used. Place the axle on two wooden blocks which are secured to the floor and clamp the axle to the blocks by pieces of strap iron or any other convenient fastener. Then secure to the forward end of the shaft a pulley which can be supported in a bracket as shown. From one of the idle pulleys on the lineshaft overhead a belt can be run to this lower pulley. The axle now can be adjusted to a running fit, and the hum can be eliminated entirely.

Excessive Oil Consumption

When excessive oil consumption is experienced, that is, a mileage of less than 500 to the gallon of oil and the engine is smoking excessively, then look for a leaky rear main bearing. At high speeds there is a considerable pumping action between the shaft and the bearing, and even though the clearance is not enough to cause a main bearing knock, there will be sufficient play to allow the oil to pass.

The remedy here is to remove the bottom pan, place a jack under the flywheel and work the wheel up and down. If it is noticed that oil is being displaced and drawn into the bearing at every motion, then the bearing should be taken up a slight amount. Remove the bottom cap and take out a shim or two. At the same time the bearing cap is off it is advisable then and there to clean out the oil return groove.

Tractor Spark Plugs as Seen by Engineer



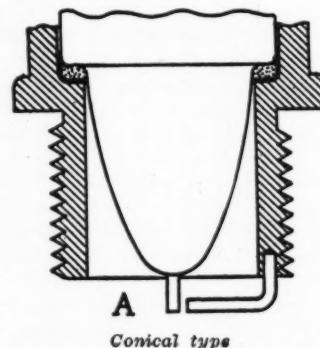
Petticoat type

A MOTOR car engine runs at full load and speed during only a very small part of its term of service. A tractor engine is running at full load practically all

the time. Because of this and the fact that low-grade fuels are largely used in tractor engines, the problem of spark plugs for tractors differs to some extent from that of spark plugs for cars.

As a rule, the use of low-grade fuel means higher compression, higher temperature and more dirt and carbon. The last item is made still worse by dust taken in while working during the dry seasons.

It is impossible at the present time to recommend any one type of plug for tractor work. High temperature engines require a plug with an insulator which is exceptionally good electrically, can stand the repeated applications of high heat and at the same time not have enough of the central electrode exposed



Conical type

to cause overheating which may induce pre-ignition. An oily engine requires a plug having an insulator with unusually long shorting surface at the firing end.

In spite of the many different plugs on the market, there are in reality just two types, those with petticoat, or open, insulators and those with conical, or closed, insulators. The former can be recommended for the engines which show a tendency to foul rapidly, while the latter are recommended only in case the extra extension of wire in the petticoat type shows a tendency to cause pre-ignition.

As a rule, the tractor owner and operator is safe in using the plug furnished with the machine by the manufacturer. Failure of one or two plugs on any particular machine should not be considered enough cause for a change to another type of plug. A few defective plugs do get out into service from time to time in spite of the utmost vigilance on the part of the plug manufacturer.

Troubles due to spark plugs may be divided into two classes—first, cutout or missing; second, pre-ignition.

A missing plug usually can be detected by shorting from the upper terminal of the plug to the engine with a screwdriver. The miss may be caused by a broken insulator. If this is the case, the plug will miss fire pretty steadily both under load and while running idle. The only remedy in case of a two-piece plug is a new insulator and, in case of a one-piece plug, a new plug.

Causes of Missing

The miss may be caused by an insulator which is weak electrically. If this is the case, it will miss when under load but will recover when running idle. The remedy in this case is a new plug with a better grade of porcelain. In a case of this kind, it is not always necessary to get another make of plug but to specify to the dealer that the very latest insulator is desired.

The miss may be caused by fouling or surface short. By this, we mean a continuous layer of carbon or other conducting material has been deposited on the lower end of the insulator and the spark is traveling through this instead of across the gap. A miss of this kind is usually intermittent for a while and finally the plug stops firing altogether. The immediate remedy is to clean the insulator by taking it out of the shell and cleaning with gasoline and by scraping if necessary.

Where plugs show a tendency to foul in this way very rapidly, especially where a wet shiny coating of oil is deposited, it is advisable to change to another brand of oil, which in many cases will get rid of most of this trouble.

Pre-ignition may be caused by other things than the plugs. If it is severe, it sometimes manifests itself by a spitting back through the intake, but it is always accompanied by a loss of power. What actually happens is this: Some part of the material inside the combustion chamber valves, carbon, plugs, etc., has become hot enough to fire the mixture before time for the spark. The piston is not yet at the top of its compression stroke when the force of this premature explosion tries to drive it back down. The

momentum of the flywheel carries it over for awhile but power of course is lost. In case of pre-ignition, the engine should be examined first to see whether there is an excessive accumulation of carbon and whether there are any particles hanging loose on valves or spark plugs.

The plugs should be looked over for rough edges on either wire or shell. If a petticoat plug is being used and no indications of this kind are to be found, it may be advisable to try a conical plug, which very often will overcome the trouble, though it may need more frequent cleaning.

Occasionally the electrode wire shows signs of pitting or burning. This is entirely due to the use of defective material and there should be very little of it. If it does occur seriously, it should be reported to the plug manufacturer or the dealer.

Always bear in mind the tractor engineers have run thorough tests before deciding which plug to use. The spark plug they finally decide upon is the one they believe to be the best suited for their engine. When a new plug is needed, the tractor user should insist upon the same plug his engine was equipped with originally at the factory.

In general the spark plug manufacturer is prepared to cope with the tractor plug problem and can furnish plugs to meet all present requirements. However, present-day development in engines and fuels is so rapid the material on the market is not always the latest obtainable. The dealers are learning to classify plugs for the various conditions of service, and if the tractor owner will specify clearly just what the plug is to be used on, he should have no trouble getting the plug he needs.—O. C. Ronde, chief engineer Champion Spark Plug Co.

GOODYEAR PLANTS ON COAST

Los Angeles, Cal., July 25—When the Goodyear Tire & Rubber Co. made known its intention to establish a plant for tires in this city it was announced the Pacific Cotton Mills Co. has been organized as a subsidiary concern, and it too will put up an enormous plant. Articles of incorporation for the Goodyear Tire & Rubber Co. of California have been filed. The capitalization is placed at \$20,000,000. The Pacific Cotton Mills Co. will file its papers within a few days. Its capitalization will be \$5,000,000.

Ascot park site and contiguous land, amounting to 40 acres, has been bought for the location. In conjunction with the industries there will be created Goodyear park, in which will be located homes for employees, built by the company. It is proposed to make this the model industrial community of the United States. Plans already have been drawn for the houses. There will be a variety of architecture, parks and playgrounds and, it is said, the entire layout will be radically different from anything of a similar nature in the country.

The tire and rubber plant will cost \$4,000,000, have a capacity of 3000 tires a day and an annual business of approximately \$15,000,000. It will employ 2500

operatives. The cotton mills will cost \$1,500,000 and will have a weekly capacity of 75,000 lb. of cord fabric and 75,000 lb. of proven fabric. It also will employ 2500 operatives. Provision will be made for the ultimate enlargement of the plants to four times their initial capacities. J. C. Drake, Harry Chandler, Lee A. Phillips, H. W. O'Melveny and J. F. Sartori are named as the incorporators.

TRADING IN OLD CAR

St. Louis, July 25—The legal department of the National Automobile Dealers' Association reports that according to a decision in the appellate court of Indiana, division No. 1, where a sale contract for a new motor car provided that the seller should attempt to sell the buyer's old car and that upon failure to do so buyer's liability for the purchase price should become absolute but did not fix a time within which the seller should notify of inability to sell, notice of such fact given to the buyer a reasonable time after the three months allowed for the sale would be sufficient, time not being of the essence.

The dealer was a Ford agent. May 29, 1914, he sold a new car for \$565, taking \$300 cash and a Buick car valued at \$265. The agreement was that if the dealer could not sell the car in three months for at least \$200, the owner should pay the dealer \$200 and take the car. The dealer was unable to sell the car within the time limit, and he sued to collect. He obtained a verdict for \$225. The court held that the dealer had only extended the customer a three months' credit and that the Buick car value was not to be applied to the purchase of the new Ford.

WHY BEING AN N. A. D. A. PAYS

St. Louis, Mo., July 25—A Kansas dealer asked the National Automobile Dealers' Association six questions concerning the application of the war tax to his business, writing a two-page single-spaced typewritten letter. The letter as handled by the war tax bureau of the legal department of the association cost the association \$1.16 to answer.

To ascertain just how much the dealer saved on this advice alone by being a member of the association, Harry G. Mook, business manager, turned the letter over to firm of certified public accountants. Their charge would be \$50 for answering the letter. A firm of attorneys wanted \$75 for answering.

U. S. L. TO DOUBLE OUTPUT

Niagara Falls, N. Y., July 25—Erection of new buildings and additions to present structures, now under way, is expected to make the plant of the U. S. Light & Heat Corp. the largest battery manufacturer in the country. The expansion will more than double production, and the various departments will be rearranged to increase efficiency.

New machinery to be installed includes double the number, together with improved types, of oxide mixing and plate pasting apparatus and new molding machines, minimizing the hazard to workmen handling molten metal.

The Readers' Clearing House

Questions and Answers

Play in Steering Gear

Q—How is the lost motion, or play, in the steering gear of a 1-38 Packard taken up?

2—What is the proper way to dismantle the rear universal joint on this model?—J. P. De Roo, Cincinnati, Ohio.

1—The Packard 38 steering gear is of the worm and nut type. See illustration in Fig. 2. The wear is taken up in this type at one place only. By turning the nut referred to as No. 28 in the illustration this play and wear is removed.

2—The rear universal joint can be taken off by uncoupling the connection at the front universal joint and the rear joint. This will permit of the removal of the propeller shaft. The rear universal joint then can be completely assembled.

Gearing of Stevens-Duryea

Q—When did the Stevens-Duryea company go out of business?

2—Publish power curve of the engine. If this is not on hand, at how many revolutions in your estimation will the power curve begin to drop?

3—Could this engine be geared 2 to 1 instead of $3\frac{1}{2}$ to 1 and realize a speed of 80 m.p.h. if the engine is in good shape.—John J. Pastor, New York, N. Y.

1—The Stevens-Duryea company never went out of business entirely. The factory has been engaged in the manufacture of war munitions. The company recently announced its plans for the resumption of the manufacture of the Stevens-Duryea car.

2—The engine used on the Stevens-Duryea is of the medium-speed type, reaching its maximum horsepower at a speed of 1800 to 2000 r.p.m.

3—The engine can be geared to this ratio without affecting its power characteristics. However, we doubt very much whether you can get the gears in the housing and still retain a sufficiently coarse pitch in order that the strength of the gears will not be impaired.

Installation of Cut-Out

Q—What size cut-out does the Revere car use?

2—Would a Stutz G. P. cut-out fit the Revere car?

3—Do sixteen-valves in the Stutz car lessen the roar of cut-out? I have been told that the cut-out on the new sixteen-valve Stutz car is not as noisy as the one used on the Stutz car when they used the Wisconsin engine.

4—Where would be the best place to install a G. P. cut-out on Stutz car?—Charlie Patterson, Jr., Benoit, Miss.

1—The size of a cut-out is determined by the diameter of the exhaust pipe. On the Revere this diameter is 3 in., the inside diameter being $2\frac{7}{8}$ in. On the Stutz car the outside diameter of the exhaust pipe is 2.997 in. and the inside diameter is 2.847 in.

2—Judging by the measurements you will be able to use these cut-outs interchangeably.

3—The exhaust noise from a sixteen-valve engine will be less than that com-

Conducted by B. M. Ikert

Miscellaneous

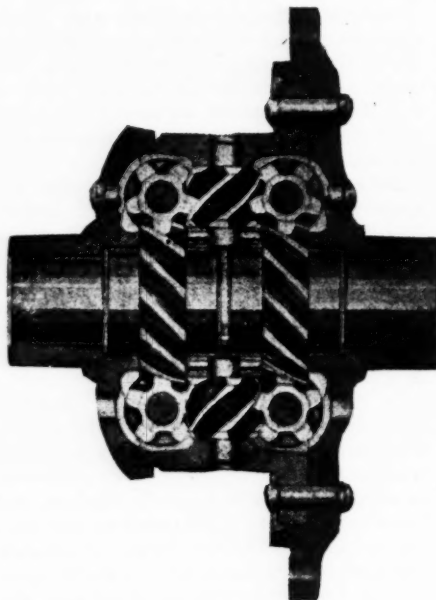


Fig. 1—Cross-section of M. & S. differential

ing from an eight-valve engine, because the valve area is increased materially, thereby lowering the velocity of the exhaust gases.

4—The most convenient place to install a cut-out is under the floorboards controlled by the left foot, because the exhaust pipe is on the left side of the car. If the cut-out lever is placed close to the seat, then the cut-out can be fitted more easily to the exhaust pipe.

Future of Steam Cars

Q—What future do you predict for the steam car?

2—Will they soon be sold in smaller and more popular models for about \$1,000?

3—Publish the brake horsepower curve of the Dodge Brothers car at various speeds of the engine up to maximum.

4—How may the horsepower of an engine be found at any speed?

5—Explain the mechanical operation of the various gearless differentials as, for instance, the Dorr-Miller, the Bailey and the M. & S.—E. J. Becker, Millville, Minn.

1—The steam car is receiving more and more attention every day. The fact that the steam cars which have been offered to the public have all been in the high-price class has been a discouragement as far as public interest is concerned. But now since every one knows that the steam car successfully burns kerosene, and that it has many other advantages, interest naturally is being aroused. Some prominent engineers have declared the future motor car must inevitably be a steam car.

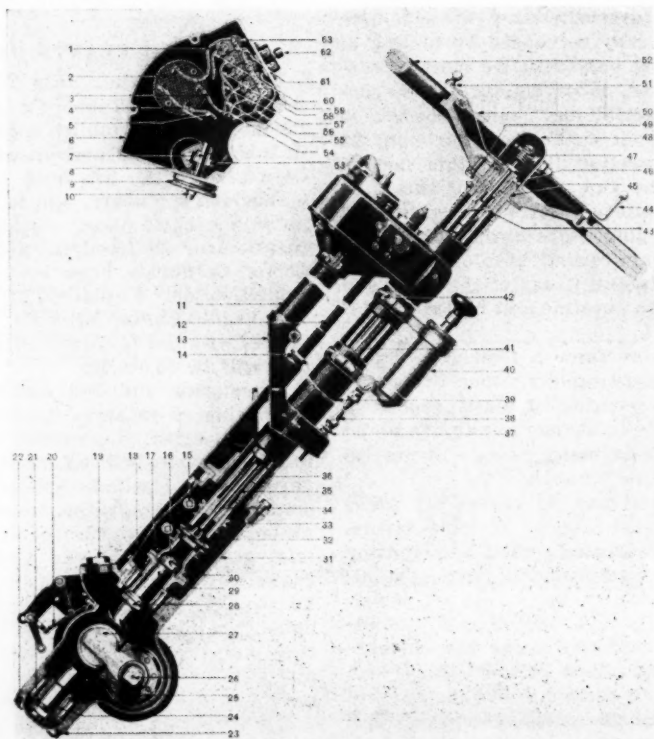


Fig. 2—Cross-section of steering gear on Packard car, showing adjustments

2—There are many rumors current that cheap steam cars are being experimented with. How soon these experiments will reach a commercial basis cannot be predicted.

3—The horsepower curve of the Dodge Brothers car is shown in Fig. 3.

4—This can be determined only by making an actual test. After the test has been made reference can be made to the chart and the horsepower read directly for any engine speed.

5—Lack of space prevents an explanation of all the various gearless or patented differentials and the action of the M. & S. differential is taken as an example. It is illustrated in Fig. 10.

In the M. & S. differential two or more spiral or worm pinions are mounted in the differential housing which is rotated by the engine. There are also two crown worm wheels, one attached to each driving wheel. In addition worm gears are interposed between the pinions and the crown wheels, the teeth of which are shaped to correspond. These worms are mounted in the differential casing with their axes at right angles to those of the pinions. It will be seen then that the rotation of the differential housing in the usual way by the tailshaft causes both pinions and worm wheels to be carried around bodily in rigid relation to each other, while at the same time both pinions and worms have a power of rotation upon their own axis, so that they can move rotationally but not bodily in relation to each other.

When road resistance is sufficient to give adhesion to each driving wheel, both wheels are driven equally, the crown wheels to which they are attached being carried bodily around by the worms in which they are in engagement, just as,

To assist readers in obtaining as a unit all information on a certain subject MOTOR AGE segregates inquiries in this department into divisions of allied nature. Questions pertaining to engines are answered under that head and so on.

MISCELLANEOUS

J. P. De Roo....Cincinnati, Ohio
John J. Pastor.....New York
Charlie Patterson....Benoit, Miss.
E. J. Becker.....Millville, Minn.
J. E. Dockter....Farlington, Kan.
Russell B. Eaton....Aberdeen, S. D.
Thomas Keefe.....Clarke, Neb.
H. J. Strom.....St. Paul, Minn.
E. D. Payne.....Lemmon, S. D.
V. S. Ogilvie....Matawan, Minn.
Walter E. Scheibner, Wilbur GarageWilbur, Wash.

ENGINES

John C. Moore.....Dayton, Pa.
Hollie Cartmill....Spokane, Wash.
George Wilson....Bellevue, Ohio
F. J. Norris.....Detroit
George Kelly, Kutscher Brothers Automobile Machine Shop.....Springfield, Ill.
Harold E. Riester.....Detroit
Lester C. Sherrard.....Fairmont, W. Va.
A. E. Stevens.....Cogswell, N. D.
Frank Hall.....Springfield, Mo.
A. J. Howard.....West Bloomfield, Wis.
C. D. Norwood....Thomasville, Ga.

THE ELECTRIC SYSTEM

Lester C. SherrardFairmont, W. Va.
James J. Stanton.....Rochester, N. Y.
Alvin F. Uhrhammer.....Inverness, Mont.
William Goldbach.....Rockville Center, N. Y.
W. S. Knox.....Chico, Tex.

REBUILDING

Ralph Head.....Ottumwa, Iowa
H. C. Brown.....Columbus, Ohio
A. L. Willson....Roseton, Canada
William J. Armstrong....Media, Pa.
Sterner Houck.....Hanover, Pa.
Leroy Rudy.....Gary, Ind.

No communication without the writer's name and address will be answered in these columns.

with an ordinary differential, they are carried round by the pinions. But when road resistance upon one wheel is reduced to a point at which it loses adhesion and, with the ordinary differential, would start spinning, nothing of this kind happens, because the angle of the worms is such that, while the crown wheels can drive the worms, the worms cannot drive the crown wheels, and, as a consequence, the differential is locked so far as any movement of the wheel in relation to the differential is concerned. The axle becomes for all practical purposes a solid one, and all the drive is taken up by the wheel, which for the moment is supported on firm ground and can take advantage of its grip.

When both wheels are on firm ground and the car travels freely, the differential is enabled to act in the usual manner when turning corners by reason of the fact, already alluded to, that the crown wheels can drive the worms. Each driving wheel is attached to its respective crown wheel and when a curve in the road is followed the outer wheel is forced by its contact with the road to travel a greater distance than the inner one. The outer wheel, therefore, revolves faster than the axle, turns the worm in connection with it and so enables the central pinions to act and react on the worms with a differential action and to distribute the power to each wheel in the usual manner. It will be seen that the action is the same in either direction, so that the gear behaves equally well whether the car is going forward, reversing or is driving the engine.

Different Tires in Rear

Q—What will be the difference in wear on tires, if any, also what action will it necessitate on the part of the differential, and will one tire exert more tractive force than the other where a regular 30 by 3½ is on one hind wheel and an oversize is used on the opposite hind wheel?—J. E. Dockter, Farlington, Kan.

The greatest amount of wear on tires of different size when fitted to the rear wheels will be on the smaller tire. This can be illustrated better by showing what will happen when the car is jacked up and the rear wheels revolving slowly. By grasping one of the tires and holding it from moving the other tire will revolve at twice its former speed. No effort will be exerted on the stationary tire, its force now being transferred by the moving tire. A differential is designed to take care of any slight unevenness in road conditions and when rounding curves, but the transmission is not designed to transmit power continuously when the wheels are revolving at different speeds. If it was, the manufacturer would not caution the owner in regard to fitting tires of the same size to the rear wheels.

Hitch for Trailer

Q—Publish diagram of a hitch for trailer on Dodge Brothers roadster.—Thomas Keefe, Clarke, Neb.

It is rather difficult to devise a trailer connection for this car. If the connection is secured to the end of the frame at the spring connection in the form of a triangle, it seems to us the problem

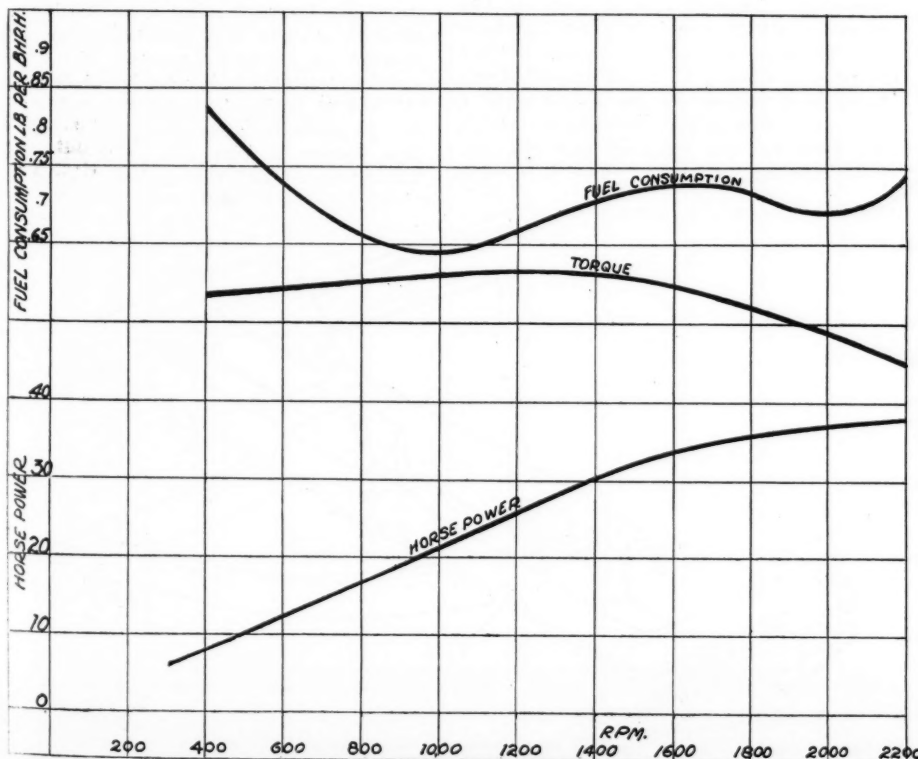


Fig. 3—Horsepower curve of the Dodge Brothers car

will be solved about the best. There have been attempts to secure the trailer connection to the rear end of the spring by using special shackle bolts. This is not so good a method, for the spring becomes overloaded and its purpose is interfered with. Fig. 5 shows two ways of attaching a trailer.

Driving a Dynamo by Wind

Q—Give some figures as to driving a dynamo, 22-volt .8-kw., by a power windmill where there is plenty of wind as in North Dakota.—Russell B. Eaton, Aberdeen, S. D.

In answer to this we give the figure quoted by A. V. Abbott in his book on the electrical transmission of energy:

Diam. of wh'l in 16-mile (ft.)	Horsepr. wind	Total cost of instal- tion	Required capacity of battery amp-hr.	Watt-hours delivered from battery*
12	0.21	\$249	5	280
16	0.41	415	10	551
20	0.79	606	32	1,762
30	2.40	1,344	103	5,640
40	4.42	2,000	190	10,390
50	6.88	3,190	294	16,170
60	10.00	4,179	425	23,500

*Assumed dynamo efficiency, 50 per cent; battery efficiency, 45 per cent; assumed daily charge, 8 hr.; wind velocity, 16 m.p.h. for 8 hr. per day.

From this you can see that the cost per horsepower is very high and is not at all commensurate with the returns. It is true that the installation once made has a very low upkeep, but the first cost is very high. It has been said by a prominent manufacturer of power windmills that a satisfactory powerplant cannot be installed for less than \$1,000. A wind electric powerplant requires a special generator with its special power equipment. Many power windmills require a gasoline engine to be run in conjunction with it, serving as a standby source of supply.

Taking Up Backlash

Q—Publish diagram of rear axle and instruct how to take up backlash in a 1910 model K Chalmers.

2—How are the flywheel and crankshaft removed from crankcase?—H. J. Strom, St. Paul, Minn.

1—The rear axle for this car is shown in Fig. 4 with the propeller shaft and sleeve removed. The shaft together with the sleeve and the other parts can be slid out of the sleeve A, as shown in the illustration. The sleeve can be moved in or out after the screw D is removed. Moving the sleeve in or out allows the pinion to be moved into closer or a less close fit, as the case may be. Looseness within the thrust bearings themselves may be adjusted by screwing up the threaded collar, which will be found locked by the locking washer, and hexagonal cap screw E. After adjustment has been made replace the hexagonal cap screw E through one of the six holes in the keyed lock washer, thus securely locking the collar upon the shaft. The annular bearings used behind the pinion at F will follow the movement of the pinion in or out as it may be adjusted by the collar C.

To adjust the ring gear, remove the aluminum housing cap. This uncovers the adjustment collar Y, which is adjusted with a spanner. The loosening of one and the tightening of another move

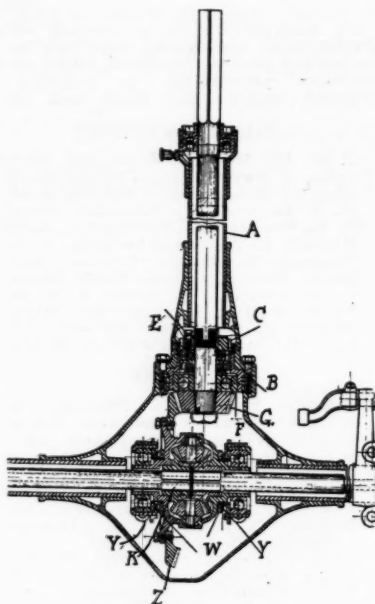


Fig. 4—Cross-section of rear axle on the Chalmers model K

the whole set of gears upon the shaft. It may be necessary to loosen the bearing caps during this operation.

Suggestion for Turntable

Q—Publish suggestion for turntable. Where can I get the material?—E. D. Payne, Lemmon, S. D.

The turntable illustrated in Fig. 9 is made of materials which can be secured from local dealers in your vicinity, such as the lumber dealer and the hardware store. It is best to make the pit of the turntable of concrete. This is not very expensive, and a durable job results with its use. The blacksmith undoubtedly has equipment to bend angle iron to any diameter. Bend the angle iron to the diameter which you will need and have the vertical leg of the angle drilled. Long bolts should be fitted through these holes and locked to the angle with a lock nut. The angle can then be set on the form for the concrete and the concrete poured around it. The bolts will

serve as a reinforcement and a fastener for the angle iron.

The top of the turntable should be made of a good grade of lumber; 2 by 6 in. pine will answer the purpose. This should be double-ply. The under section does not have to be fitted as closely as the top section. If the local hardware dealer cannot procure the rollers for you, they can be turned out from a casting very easily. The wheel can be supported on brackets made by cutting off 5-in. sections from a piece of angle iron. The number of wheels used will be somewhat dependent upon the size. If 6-in. or larger wheels are used, four will carry the load, and if smaller, more will be necessary.

Why Carburetor Leaks

Q—What causes a Rayfield carburetor to leak about a pint after the engine stops? It is a Chandler.—V. S. Ogilvie, Matawan, Minn.

It is very possible there is an accumulation of dirt in the float chamber of the carburetor. This often happens and causes the float to stick or else causes the needle valve to stick. In either case the gasoline is allowed to flow through the needle valve, thus flooding the float chamber and causing the carburetor to leak. The remedy is to clean the carburetor and remove all traces of sediment.

Excessive Oil Consumption

Q—When a Dodge Brothers engine is slightly worn does it consume an excessive amount of cylinder oil?

2—If this is true, what will remedy it when new step-cut piston rings properly fitted will not prevent it?—Walter E. Scheibner, Wilbur Garage, Wilbur, Wash.

1—Our experience with the Dodge engine has convinced us that this is not the case. If, however, you find that your troubles are contrary, you might change the brand of lubricating oil you are using. We have in mind a particular engine on a new Mitchell that was consuming an excessive amount of oil, and upon investigation it was found that the oil was at fault. The oil was suited for use in certain types of engines, but in this engine it was not. Carbonization had occurred and the carbon lodged be-

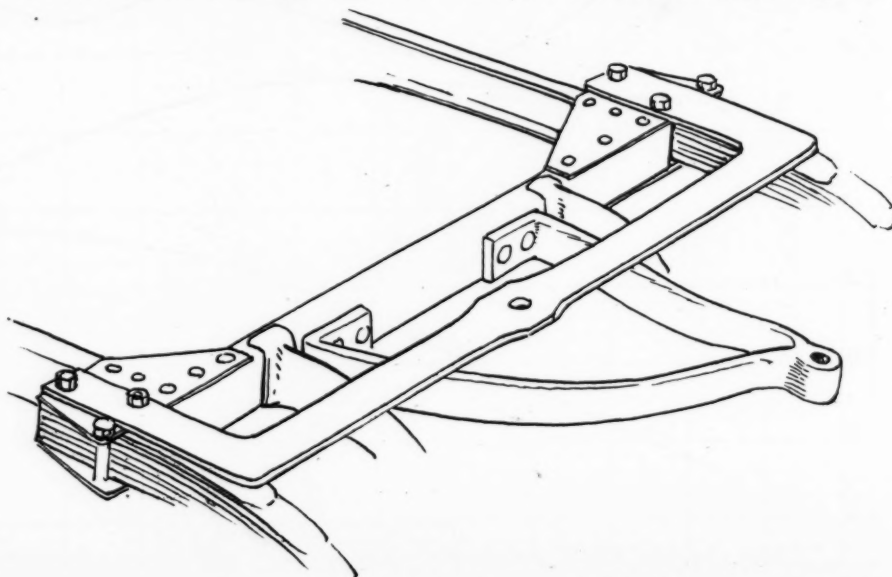


Fig. 5—Two ways of hitching trailer to roadster

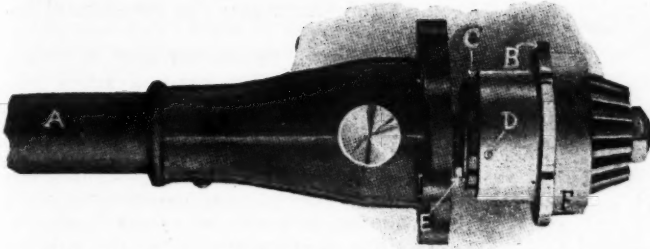


Fig. 6—Pinion adjustment on the Chalmers K

hind the rings, sticking them to the pistons. This allowed the oil to pass in excessive quantities.

2—We can hardly believe the oil is not stopped from passing the rings, especially if they are of the patented type and properly fitted. Your question is really a reflection upon the designer of the ring or else your own installation methods, for either one or the other must be at fault. If the ring is designed improperly it is not built right, and no end of fitting will ever cause the ring to be tight. If the ring is designed and built properly, then the fitting is at fault.

Are you sure that in fitting the rings the cylinder was measured with a micrometer to determine its departure from true circular form? Not more than a thousandth of an inch tolerance should be allowed if the work is to be done completely. All these little things must be considered when installing new rings if the full advantage of the ring is to be taken.

Engines

Sundry Engine Queries

- Q—Are air filters as applied a commercial success?
 2—Does the engine take in dust through the breathing pipe? If so, can this be prevented?
 3—Do you advise setting valve tappets when the engine is cold or warm?
 4—What clearance should the valve have when set warm? When cold?
 5—What clearance should the spark plug have?
 6—What is the firing order of a Saxon six, 1916?
 7—Which is the inlet valve and outlet valve?

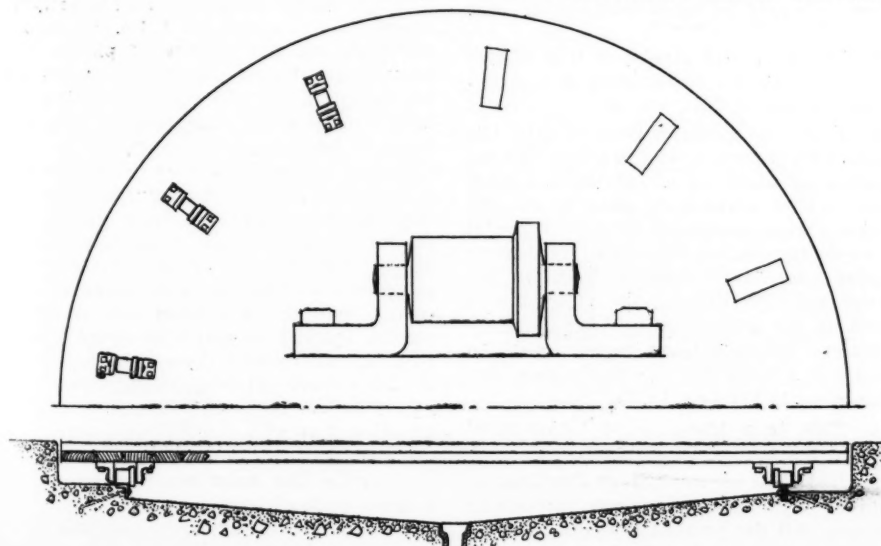


Fig. 9—Suggestion for turntable made from local materials

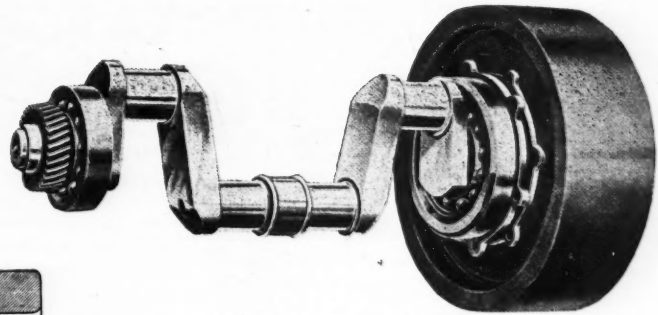


Fig. 8—Crankshaft and flywheel assembly on Chalmers

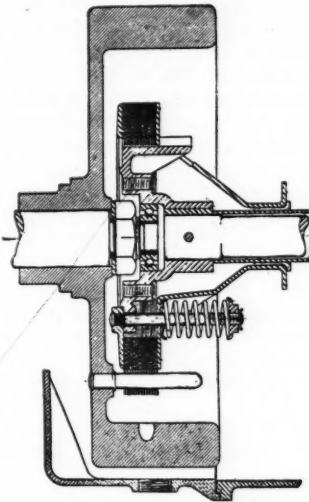


Fig. 7—Clutch on the Chalmers K

8—In setting valves should the outlet have more clearance than the inlet?

9—What is good to clean up reflectors that have become tarnished?—John C. Moore, Dayton, Pa.

1—Efficiency of the air filters as applied to tractors is a large factor in contributing to the reliability of the tractor. That they are a success can best be learned by examining the dust-collecting tank. Given more time for development, the air washer no doubt will be considerably improved.

2—If you mean the breathing openings inside the valve tappet chamber, you will find that very little dust, if any at all, is drawn in through these openings.

3—It is more convenient to set the tappets on the ordinary engine when cold.

4—The clearance allowed the valve

tappets when cold theoretically is taken up when the engine is operating. In practice this ideal condition is not quite approached, and it will be found that the hot clearance is 0.001 in. or thereabouts. When cold the clearance is about 0.002 to 0.003 in.

5—The spark plug clearance should be 0.025 in. to 0.030 in., about the thickness of a worn dime.

6—The firing order of the Saxon six is 1-5-3-6-2-4.

7—This can be noted best by observing the position of the outlets on the exhaust manifold. The valve nearest the outlet passage is the exhaust valve.

8—The outlet valve, because it is in more constant contact with the hot gases should have a slightly larger clearance, 0.001 in.

9—Any good silver polish.

Spark Plug Electrodes

Q—What metals are best for spark plug electrodes? What metals are most used for the electrodes?—Hollie Cartmill, Spokane, Wash.

Manufacturers of spark plugs are very reluctant toward giving out this information, as they obtain the formulas for the metals at the expenditure of a great deal of money and energy. Some use tungsten, others use nickel steel. Electrical conductivity need not be considered to such a great extent, for the resistance of the electrode will be very little at the most. The chief essentials for an electrode are that the metal does not corrode or pit, that its coefficient of expansion be not so very different from that of the insulating material. Platinum would be a very excellent metal for this, but the expense is prohibitive.

Timing Auburn Six

Q—Instruct how to time a 1915 Auburn six, from which chains, driving cam shafts and generator-distributor have been removed.—George Wilson, Bellevue, Ohio.

The 1915 Auburn had its valves timed as follows: Intake opens 10 deg. late, and closes 28 deg. late. The exhaust opens 40 deg. early and closes 2 deg. late.

Putting in Piston Rings

Q—I expect to put new rings on a 1917 Studebaker four. In putting on patented high-compression ring should it be put in the top groove or the bottom one? The pistons have three rings above the wristpin and one below, making four rings to each piston.

2—In lapping in the common rings, is it done the same as a piston?—F. J. Norris, Detroit.

1—For a piston with three top rings and one wiper ring at the bottom, it

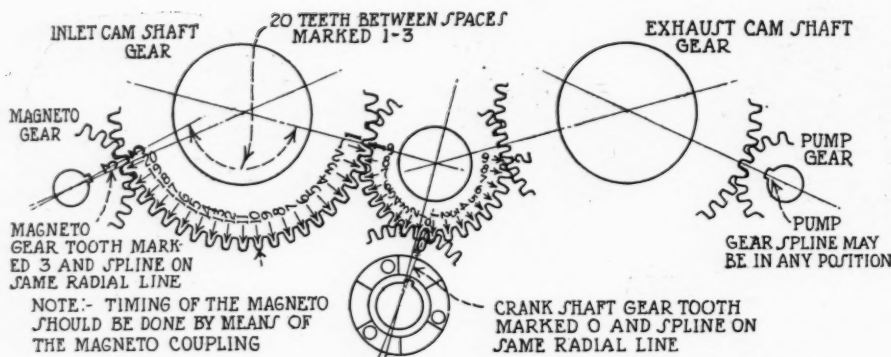


Fig. 10—Rear end of crankshaft on Lozier engine, showing firing order

should be sufficient to install patented rings on the lower two of the upper three grooves. The lower ring is probably a wide ring, and this can be left as it is. The top grooves can be fitted with an ordinary snap ring.

2—The rings should be fitted to the piston on which they are going to operate. Then by coating the surface of the ring with a mixture of ground glass and oil or any good non-magnetic grinding compound, the piston should be placed in the cylinder bore and worked up and down several strokes. If the engine has a removable head the operation is simplified, for the piston can then be inserted upside down and the connecting rod will serve as a handle to hold the piston while it is being worked up and down.

The rings also should be lapped to fit the grooves of the piston. This is done by tacking a fine grade of emery paper to a perfectly smooth board. The ring then is placed flat on the emery and rubbed lightly over the cloth. After a few strokes the fit of the ring on the piston should be determined. If the ring fits nicely in the groove with no perceptible movement sideways, then the fit is proper. Care should be taken to see that the ring is not made too small during this operation.

Grinding to Increase Valve Lift

Q—Is it advisable to grind off the heel of camshaft on model 31M Buick? I could get about 3/32 in. more valve opening. Give correct way to grind.—George Kelly, Kutscher Brothers Automobile Machine Shop, Springfield, Ill.

When grinding the camshaft to increase the lift of the valve care must be taken to see that the radial portions of the cam is retained in the same angular distance as is illustrated in Fig 11. A radial line drawn through the tangent point where the lobe meets the circular portion should be in the same relative position after the cam is ground, that is, the radial angle should be the same before and after grinding.

Engine Questions Answered

Q—What is the bore and stroke and piston displacement of a 1915 model K Hupmobile?

2—The timing gear chain and starter chain and gears are worn so that they make a loud hum and cracking noise on this car. It seems that the chain is harder than the gears, for the gears have grooves worn in from the chain. Would changing the gears and chains around remedy this noise or do you think the chain is stretched and new gears and chains are advisable?

3—What is the bore and stroke and piston displacement of a model 32 Hupmobile?

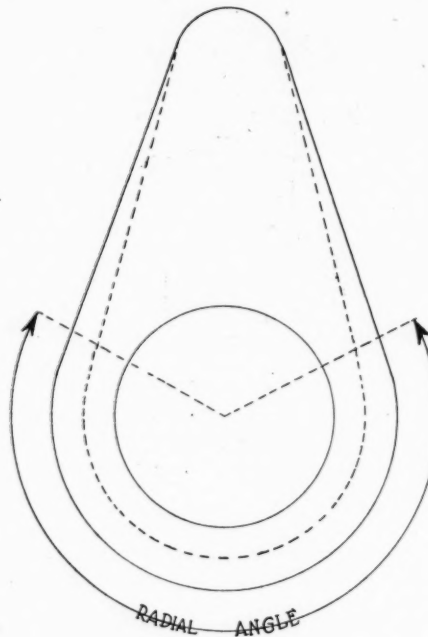


Fig. 11—Radial portions to follow in grinding cam to increase valve lift

4—What is meant by a Continental Red Seal engine? Is this the best grade of engine Continental manufactures?

5—What is the bore and stroke of a Red Seal engine?

6—Is the engine in the Saxon six designed and built by Continental?

7—In your article on motor troubles in the May 22 issue you state a certain knock is heard at crankshaft speed and another knock heard at camshaft speed. What is meant by these different speeds? Harold E. Riester, Detroit.

1—The bore and stroke of this engine is 3.375 by 5.5 in., which gives it a piston displacement of 196.2 cu. in.

2—It will do material good to reset the chain with reference to the gears, for the number of teeth on either the camshaft gear or the crankshaft gear is an odd number when compared to the number of links on the chain. This is equivalent to saying there is a rotative relation between any one link on the chain and a tooth on the gear.

3—The Hupmobile 32 has a bore and stroke of 3.25 by 5.5 in. The piston displacement is 182.9 cu. in.

4—This is a trade name Continental uses in identifying its product.

5—Red Seal as applied to Continental engines does not mean any particular engine. All the present engines made by the company are Red Seal engines, but there are different types and sizes.

6—The Saxon uses the Continental engine.

7—The two speeds referred to meant the camshaft might cause a knock and the crankshaft and other elements revolving with the crankshaft might cause a knock. Since the rotative speed of the camshaft is half that of the crankshaft there are two possible speeds at which a knock might occur while the engine is running constantly. A knock can be classified immediately by determining whether it occurs every time the crankshaft comes around or every time that the camshaft comes around.

Timing 1913 Lozier

Q—What is the firing order of a Lozier 51 1913, six-cylinder car?

2—Instruct how to time the valves.—Lester C. Sherrard, Fairmont, W. Va.

1—The firing order of the 1913 Lozier is 1-2-3-6-5-4.

2—This is shown in Fig. 10.

2—To remove the crankshaft from this car is quite a task, for the shaft is a two-bearing ball race job. The larger bearing is at the rear, so the shaft must be pulled out this way. Fig. 10 shows the rear end of the shaft and the method by which the shaft is secured to the flywheel. All the housings must be removed and the clutch taken out. This exposes the large nut on the end of the shaft which holds the shaft to the wheel. After the shaft is removed, the camshaft drive gear should be removed, for these gears are of the spiral type and the gears cannot be pulled directly out. The connecting rods, of course, must be removed. Now you are ready to remove the shaft. This will be quite a task, for the shaft bearings are set in their retainers with an hydraulic press, and it is necessary to apply a large amount of force to remove the ball bearing race.

Difference in Horsepower

Q—Is there any difference in the horsepower developed by a 4½ by 6¾-in. engine running at 750 r.p.m. and a 4½ by 6 engine running at 850 r.p.m.? If so, how much?

2—Is a long-stroke engine as good for burning kerosene as a short-stroke engine?—A. E. Stevens, Cogswell, N. D.

1—We assume you have reference to tractor engines in asking this question. Tractor engine horsepower ordinarily is based on the rating of 1 hp. for every 13,000 cu. in. per minute of piston displacement. Based on this your 4½ by 6¾-in. engine at 750 r.p.m. will develop 24.78 hp., and the other engine will develop 25 hp.

2—The present tendency in tractor engine design is toward a square cylinder, that is, one where the bore equals the stroke. This has not been approached as yet, but it seems to be coming. Engines of years ago were designed in this way. Then the European idea of long-stroke, small-bore and high-speed invaded this country with the result that much of this square cylinder design was given up. This all happened though when the gasoline was of a very good grade. As the quality of the fuel slowly depreciated, the stroke has been made shorter, the present ratio of bore to stroke on car engines is 1.30 to 1. For tractor engines this ratio is slightly less, being 1.29.

For poor grades of fuel and kerosene

this ratio will no doubt approach unity, for with that ratio there is opportunity for securing high engine speeds without having such high piston speeds. Also the thermal efficiency of the engine is improved. The piston rising to its top dead center in a shorter space of time leaves less chance for the dissipation of the compression heat to the cylinder walls.

Thus far it seems that the short stroke engine has all the advantages, but this is not so. The long-stroke engine gives greater chance for having lightweight reciprocating elements, which tends to reduce vibration to a great degree. The short-stroke engine brings the explosion chamber closer to the working parts. With the long-stroke engine the heat being further removed from the crankshaft permits of a lower working temperature in the crankcase, with the consequent bettering of lubrication conditions. Heat being one of the deteriorating effects upon lubricating oil, this advantage is a big one.

Increasing Engine Speed

Q—A Ford engine turns at about 1250 r.p.m. What alterations could be made to get about 1400 r.p.m.? It has a Bosch high-tension magneto and a Schebler model N carburetor.

2—Would aluminum pistons be better for speed than the iron pistons bored full of holes.

3—Would enlarging the valve ports to Dodge-size help any?

4—Would a faster carburetor increase the speed?

5—How can the Ford camshaft be ground down to make a high-speed camshaft?

6—What is the best way to tell the horsepower of the engine?—Frank Hall, Springfield, Mo.

1—The alterations for increasing the speed of your Ford engine are given in answer to the succeeding questions.

2—Reducing the vibratory force within the engine will increase the speed. It is a much better idea to install alloy pistons than to drill the pistons full of holes as you say. The chief objection to drilling the pistons full of holes is that the wall pressure on the piston or the side thrust of the piston is increased per unit area and this causes more wear. Of course, where new engines have drilled pistons this reduced area has been taken care of by making the pistons longer.

3—Larger valves increase the power considerably, but the speed will not be increased to the same extent.

4—Yes, use some good grade of fast carburetor.

5—The diameter of the radial portion of the shaft should be reduced the amount of the desired increase lift in height.

6—Testing the horsepower of an engine is more than a repairshop job. The engine must be mounted on a dynamometer block and the output of the driven dynamometer measured. A dynamometer of the electric type is an electric generator. This is coupled to the engine and driven through a universal joint generally. The output of the generator is measured conveniently by using a voltmeter and an ammeter. The product of the reading of these two instruments gives watts. The number of watts thus obtained divided by 746 gives horsepower, for there are 746 watts in 1 hp. The efficiency of the generator must be known, for the loss in the generator, while not measured by the instruments, nevertheless is produced and must be taken into consideration.

Must Be Loose Piston

Q—I put patented rings in a 1916 6-30 Chalmers. The car has a knock in the second or third cylinder. It seems to be up near the head. When the engine has

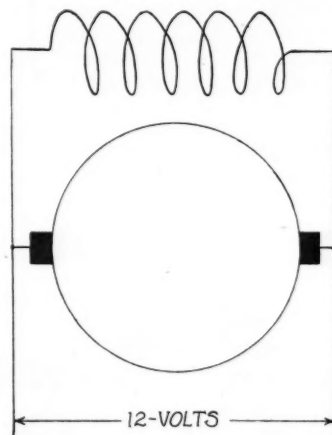


Fig. 12—Internal connections of Bosch ignition generator

to pull you cannot hear the knock, but when the engine runs idle or up to 30 m.p.h. and then the gas is shut off and let the speed of the car turn the engine over, the knock is very loud.—A. J. Howard, West Bloomfield, Wis.

We are inclined to believe this knock is caused by a loose piston. When the load is lifted suddenly from the top of the piston the upward inertia causes the piston to continue upward until the extra looseness is taken up. Then the piston is stopped with a jerk. Ordinarily a knock is produced only under load, but piston knocks, not piston slaps, may be produced under no load. The exact cylinder can be determined by loading the car with the brakes and then shortening the cylinders one by one by pulling the spark plug terminal. When the proper cylinder is reached the sudden let-up of the load on that cylinder will cause the knock to appear.

Using Larger Cams

Q—In a rebuilt Ford speedster if I use an intake manifold 1 1/4 in. in diameter should I use a larger carburetor?

2—If I use Dodge Brothers valves, should I cut the ports out accordingly, as well as the seats?

3—Would you advise using a larger cam on the intake valves only or on both the intake and the exhaust valves?—C. D. Norwood, Thomasville, Ga.

1—Unless the passages in the engine are made correspondingly larger to meet the increased size of the manifold it will not be necessary to use a larger carburetor.

2—The standard reamer for the Ford valve ports can be reamed directly through the port, thus increasing its size in diameter about 6 in. A Dodge valve then can be used to fit this increased size port.

3—If the cams are to be enlarged, both of them should be given attention.

The Electric System

Wiring of 1913 Lozier

Q—Publish wiring diagram for Lozier 51, 1913, six-cylinder car.—Lester C. Sherard, Fairmont, W. Va.

This is shown in Fig. 13.

Internal Wiring Diagrams

Q—Publish internal wiring diagram of Bosch ignition generator type G4N4 12-volt.

2—Publish inside layout of the Bijur regulator cut-out used on Packard cars.—James J. Stanton, Rochester, N. Y.

1—The principal and internal connections of the Bosch ignition generator are shown in Fig. 12.

2—The internal connections of the Bijur regulator and cut-out are shown in last week's issue in the wiring diagram series.

Recharging Ford Magnets

Q—The 1919 Ford displays all the characteristics of having weak magnets. The engine does not start easily when cranked. The lights burn dimly. The engine must be spun to start. Publish suggestion for recharging magnets.—William Goldbach, Rockville Centre, N. Y.

It is not a very difficult operation to charge the magnets on the Ford car without removing them from the flywheel. The success of the operation depends upon the correct setting of the flywheel. This is done easily with the

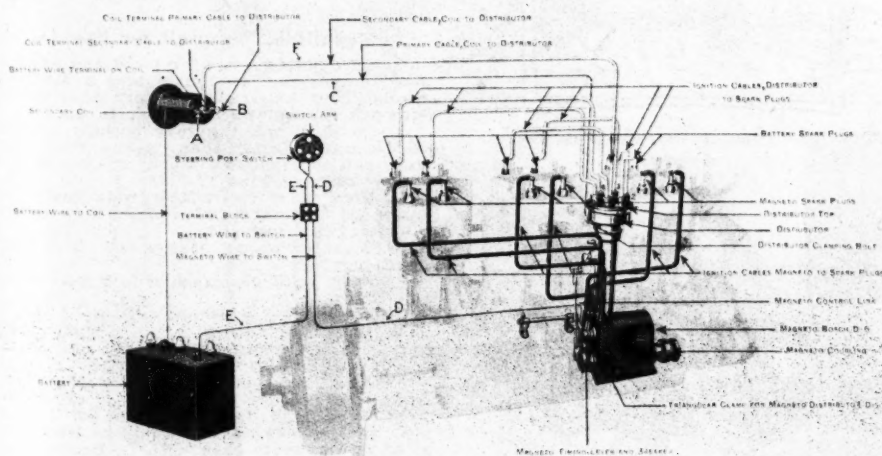


Fig. 13—Wiring diagram of electric system used on Lozier

aid of a compass. Remove the spark plug or else open the priming cocks and have someone turn the engine over by hand very slowly. Disconnect the ignition cable from the magneto terminal and hold the compass 6 in. to the rear and 1 in. to the left of this terminal. As the engine is being turned the compass needle changes its direction.

When the compass is in this position and the north-seeking end of the needle points straight toward the front of the car, then the flywheel is in the correct position. All that remains to be done now is to force the necessary amount of current through the coils. This can be secured from six or seven storage batteries connected in series, grounding the negative terminal of the batteries to the frame of the car and tapping the positive terminal of the battery on the magneto terminal five or six times. Current from the house lighting system can be used if it is direct current; otherwise a rectifier must be used.

A resistance must be inserted in series with a house lighting current, which will consume about 70 per cent of the voltage, leaving 30 per cent to be consumed in the coils by the magneto.

To Regulate Charging Rate

Q—A Ward Leonard generator used on the Columbia six generates 6 amp. at 20 m.p.h. This does not seem to keep the battery charged up. What should it charge and what are the adjustments to make it charge more?—Alvin F. Uhrhammer, Inverness, Mont.

The charge rate for a 6-volt system should be about 14 or 15 amp. Some advocate a higher rate, inasmuch as the fuel continually grows worse and starting becomes more difficult. By removing the cover over the regulator the adjustment screw will be exposed. Turning this one way or the other will increase or decrease the rate. This can be learned by observing the ammeter.

Charging Ford Magneto

Q—In your issue of June 26 you give instructions to charge Ford magneto without removing same from frame. I do not thoroughly understand your method. What is the object in the compass being placed as you give it?

2—Can dry cells be used? If so, how many?

3—Can current from a 32-volt Delco Light plant be used?

4—Can current from a 110-volt generator be used if the rheostat is made to hold the current down? If so, what should voltmeter read?

5—If one of these methods are used with success, will the magneto be as strong as originally, provided the field coil and clearance are O. K.?—W. S. Knox, Chico, Tex.

1—The object of setting the engine of a Ford in a certain position with the aid

of a compass, as described in the issue, is to line up the rotating magnet with the stationary field coil. The proper position is secured when the north end of the needle points directly forward, provided the compass is 6 in. to the rear and 1 in. to the right of the magneto terminal. This will place the south pole of the field coil opposite the north pole of the permanent magnet. When the charging current is forced through the field coils the magnetism is transferred to the permanent magnets by induction.

2—Dry cells cannot be used except by using several hundred of them. The reason for this is seen when it is realized about 50 or 60 amp. are necessary to produce the magnetism in the coils. It would take many dry batteries to produce this amount of current.

3—If the current from the Delco system is to be used, a special line should be run from the batteries to the terminal on the car. If the

regular line is used for this, the current consumption will be so heavy the fuses will be blown out. The time of flow to perform this operation is very short, only a few seconds.

4—A 110-volt generator can be used to charge the magnets if a resistance is inserted in series. The resistance of the Ford coils on the cars since 1915 is 0.25 ohms. As 30 volts is sufficient to charge the magnets, when the resistance is connected in series on a 110-volt line the voltage drop measured across the resistance should be 80 volts.

5—This method has been used with success. It charges the magnets and makes them just as strong as they were originally. The limit of charge on any magnet is determined by the saturation point of the steel. If the magnets contained 100,000 lines per square inch originally, it is possible to bring them back to this state again by this method.

Rebuilding

Further Details on Cyclecar

Q—I expect to build a cyclecar on the same lines as the suggestion shown in the June 19 issue of Motor Age. What wheelbase is best?

2—What gear ratio should be used for a car using a twin-cylinder motorcycle engine, 28-in. motorcycle wheels and carrying two passengers, to obtain lots of speed and still have power left for country roads?

3—Where could I purchase an engine with either two- or three-speed transmission and clutch?

4—The wheels of a Saxon four being the same size as motorcycle wheels, could I use those wheels and also Saxon steering knuckles?—Ralph Head, Ottumwa, Iowa.

1—The wheelbase of the ordinary cyclecar is about 86 in., although 90- and 100-in. cars have been made. The wheelbase used is largely dependent upon the builder's desires.

2—The gear ratio of about $3\frac{1}{2}$ to 1 on high is proper to use with a twin-cylinder motorcycle engine.

3—Look through the advertising columns of Motor Age and write to some of the parts dealers or car wreckers. They very often can supply you with any part that you desire.

4—Saxon wheels will do very well for this car. In fact, they will be better than the ordinary motorcycle wheel, because provision is made for a regular spindle axle.

Rebuilding Maxwell for Speed

Q—In building a car for speed and using a Ford engine and rear axle and a Maxwell frame, front axle and radiator, what model Maxwell frame would be best to use?

2—Could I use the rear springs on the Maxwell and fasten them to the Ford rear axle without machine work, or would the radius rods interfere?

3—Show how the radius rods could be fastened to the frame in case they would interfere with springs?

4—What company makes oil force-feed hand pumps?

5—What road clearance will I have with this outfit?

6—With Roof overhead valves, 3 to 1 gear, heel ground off of camshaft, good line body and 30 by $3\frac{1}{2}$ -in. wheels, what speed can I reasonably expect?

7—What car could I get a steering post from that I could use on this model Maxwell frame and front axle to get longer post, as I believe the car would be too short after setting seats back?—H. C. Brown, Columbus, Ohio.

1—Any late model Maxwell frame can be used for this reconstruction.

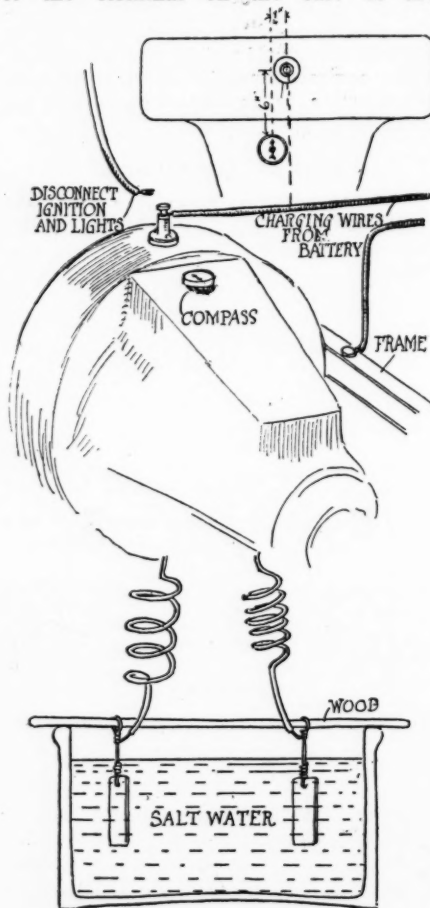


Fig. 15—Apparatus for recharging Ford magnets

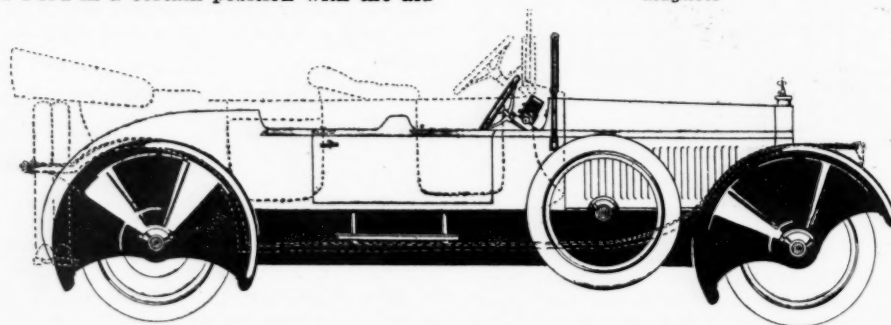


Fig. 14—Suggestion for changing Packard into four-passenger

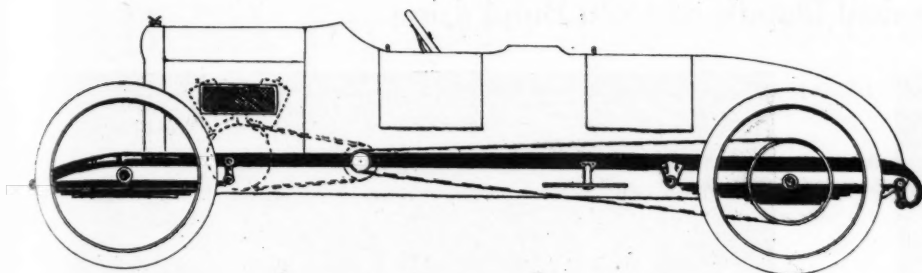


Fig. 16—Suggestion for four-door body on car with motorcycle engine

2—Some machine work will be necessary. The spring on the Maxwell is secured with four bolts, while the Ford has a spring shackle bolt. A special collar fitting around the shaft probably will be necessary, or it might be possible to fit this connection from the Maxwell shaft to the Ford shaft.

3—Using the Maxwell semi-elliptic springs, it will not be necessary to use the Ford radius rods.

4—Hand pumps for auxiliary oil feed are made by the Cox Brass Mfg. Co., Albany, N. Y.; Essex Brass Co., Detroit Imperial Brass Mfg. Co., Chicago, and the Lunkenheimer Co., Cincinnati, Ohio.

5—The road clearance will be practically the same as in the Maxwell. Both cars use the same size wheels, and the engine size and wheels are about the same.

6—Your car ought to do about 75 m. h.p. with this equipment and a gear ratio of 3 to 1.

7—You probably would have to order this steering gear complete from some motor car company. It seems to us that the Dodge car would be slightly longer

and suitable for your use. Other cars in this same size class will also do.

Making Fast Speedster

Q—Publish suggestion that will in any way help to increase the speed in a 1919 6-30 Chalmers five-passenger touring car I wish to convert into a fast speedster. I will use racing body and discard fenders and runningboards.—A. L. Willson, Roseton, Canada.

If you wish to make a real fast car out of your Chalmers, it will be better to go over the whole car, making a few changes here and there. The rear axle in any event should have the ratio changed. By increasing the ratio to about 3 to 1 your speed will be increased materially, although the power and hill-climbing abilities of the car will not be nearly so good. Several things can be done to the engine to increase its speed. An oversized valve reamer should be used and the clear opening of the valve port can be made slightly larger. Then install a larger valve. Lightweight pistons also help considerably. Aluminum alloy pistons are much better for this purpose. Using the old iron pistons and drilling them for lightness is not recommended. Drilling the pistons reduces

the effective wall area, which increases the unit intensity of pressure. This noticeably affects the wear of the piston wall.

Making Speed Body

Q—What material should be used in making a speed body for a Ford car? If of sheet iron, what size and how may this be cut to size in the easiest way?—William J. Armstrong, Media, Pa.

The material to be used for body building depends a good deal on the shape of the body. If the body is to be composed of straight surfaces with simple curves, bending in one plane only, then it is possible to use plywood. This material is bent very easily after steaming or soaking in water. If compound curves are to be used, then metal is preferred, because it is bent more easily. About 20-gage sheet steel is recommended, because that is about the heaviest the tinsmith can bend in his machine. That is where 180-deg. bends are to be made for joining purposes, etc. It is best to make a pattern from heavy paper, as the shape then can be studied and rearranged with very little effort and small cost.

Four-Passenger Sport Model

Q—Publish sketch of a 1916 Packard 1-35 changed into a four-passenger sport model built along the lines of a Hudson Super-Six speedster with wire wheels and two extra tires, one on either side of car.—Sternier Houck, Hanover, Pa.

This is shown in Fig. 14.

Four-Door Body Type

Q—Publish suggestion for four-door body for use with a two-cylinder motorcycle engine and bicycle wheels.—Leroy Rudy, Gary, Ind.

This is shown in Fig. 16.

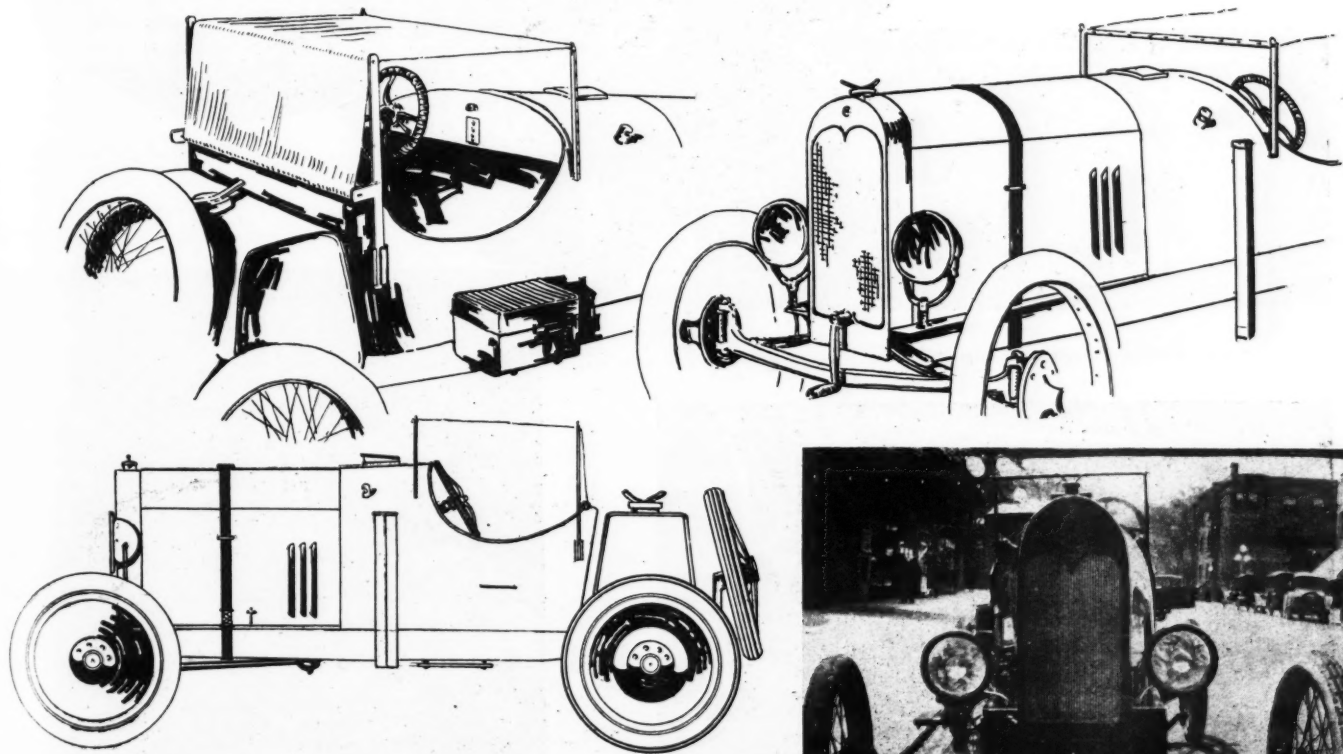
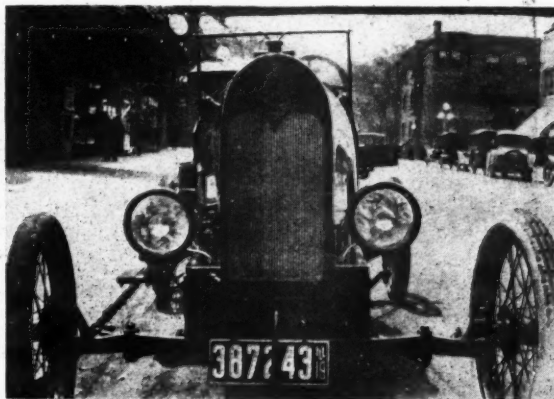
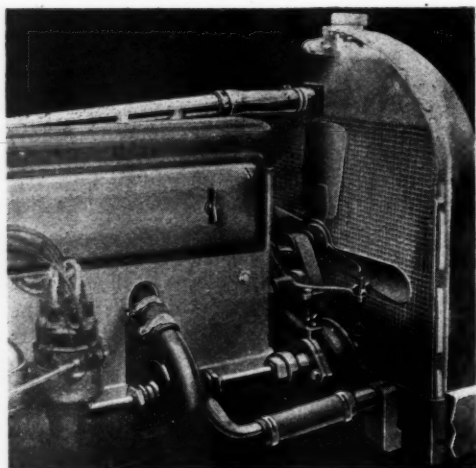


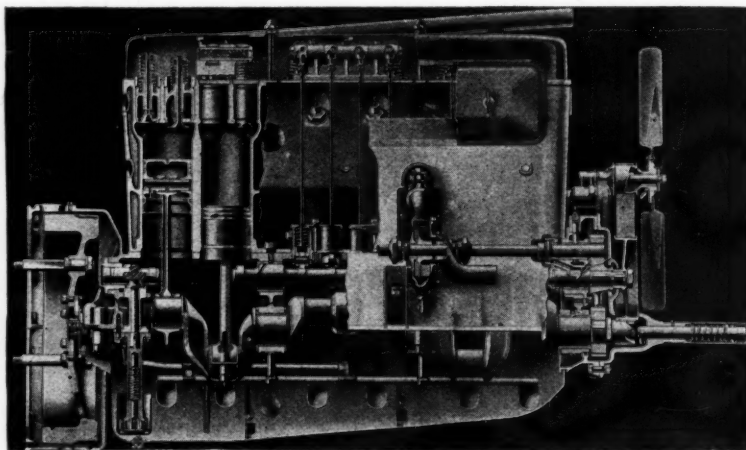
Fig. 17—This Ford rebuilt by Roy Nickles, Chicago, has a very unusual top. A roller shade pole is used, which winds the top up when not in use



Mechanical Details of 1920 Buick Line

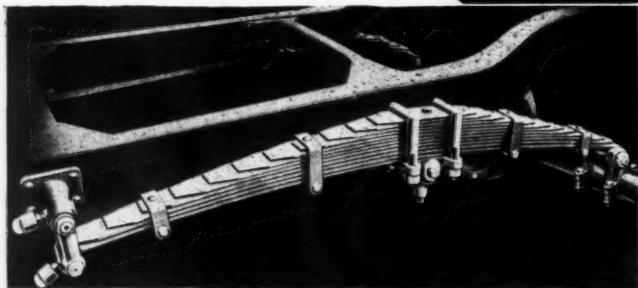


Cooling system on the 1920
Buick

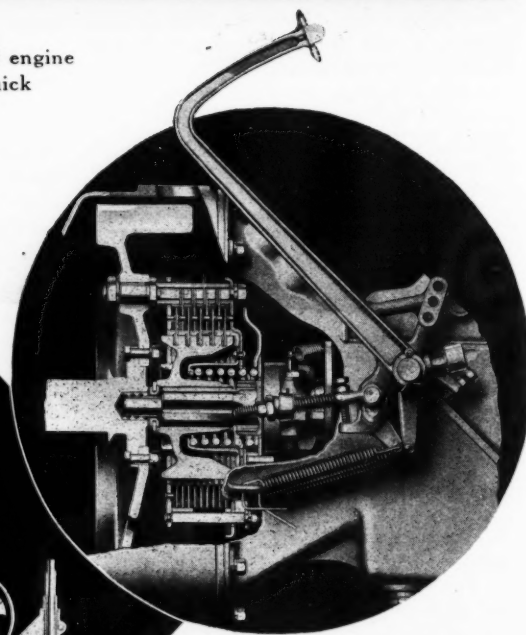


Cutaway view of engine
on 1920 Buick

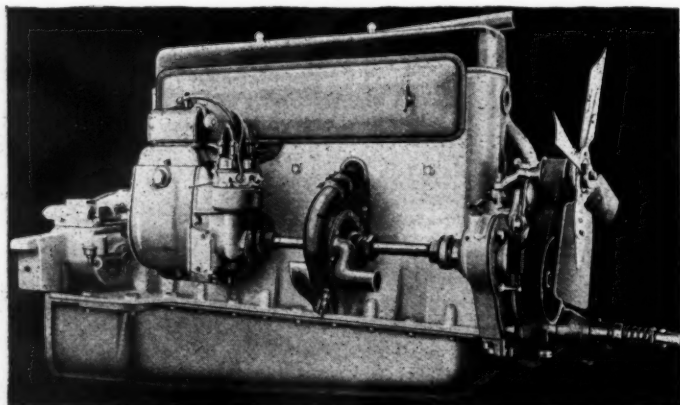
At right, semi-irreversible
steering gear



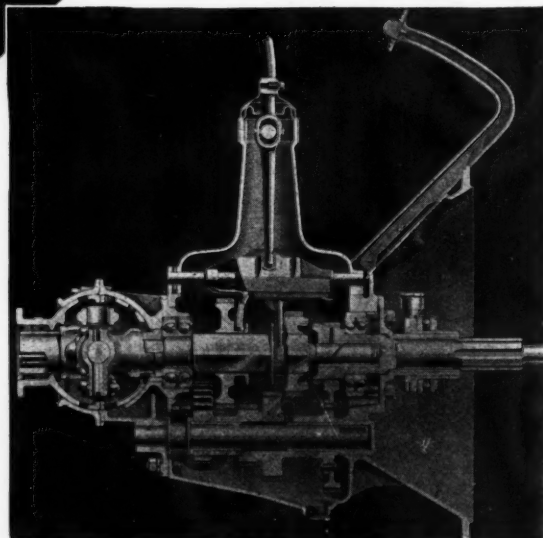
Special cantilever spring construction on Buick



Patented dry-plate
disk clutch



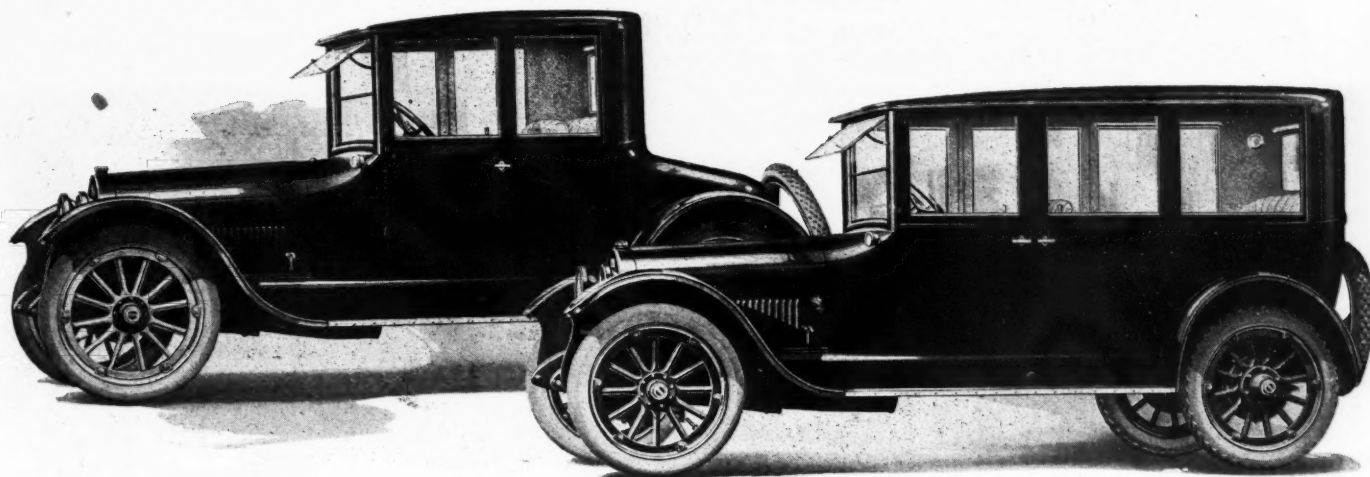
Minor changes have been made in the Buick engine



Cross-section of transmission on new Buick

Buick for 1920 Shows Minor Improvements

Improved Battery Used—Body, Chassis and Engine Slightly Different



The appearance of the Buick is about the same. Besides the coupe and sedan shown are four other models

THE Buick models of 1920 bear no marked differences from the models of 1919. The same five- and seven-passenger chassis models, having their respective wheelbase of 118 in. and 124 in. and using the same engine of 3% by 4½-in. bore and stroke, have mounted on them a three-passenger roadster, a five-passenger touring, a touring coupe and a five-passenger touring sedan body for the smaller chassis. The larger chassis is fitted with a seven-passenger touring and a seven-passenger sedan body.

The same engine of 3% by 4½-in. bore and stroke is used, excepting four minor changes. The oil well wing plug has been removed; the oil pump drive-shaft is now made of die-cast bronze instead of cold rolled steel; the fan spider and blades are made of heavier material; and the fan belt has been altered slightly.

Changes in Chassis

The chassis of the new models have two important changes. A flatter spring construction is used. The body height at the rear of the car has been lowered 1 in. by this change. On the larger and heavier models stiffer springs are used to prevent contact of the bumpers and the frame when traveling over rough roads. The turning radius of these models has been made adjustable by providing adjustment stops on the steering gear. Because of the lower spring suspension, the driving strut rods have been lowered to prevent interference with the frame. The Champion speedometer is now installed as regular equipment, and this has necessitated a small change in the gearbox, since the drive for the speedometer is taken from the rear end of the gearbox instead of the right front wheel.

Other minor improvements on the chassis include improved oil and gasoline tank fillers and a lower hanger to accommodate the Willard battery, type S-J-W-N-4. This battery is of an improved type, having larger sediment

collecting spaces. The plates are burned to the post bridge at a point near the center of the plate, to eliminate breakage due to vibration. Other

Buick 1920 Specifications

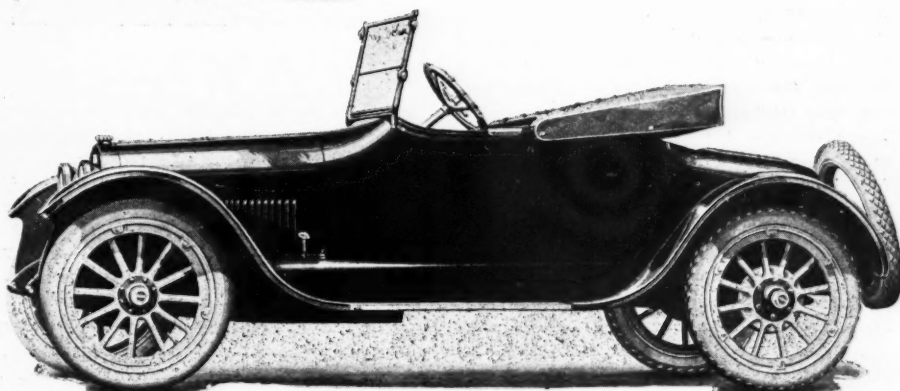
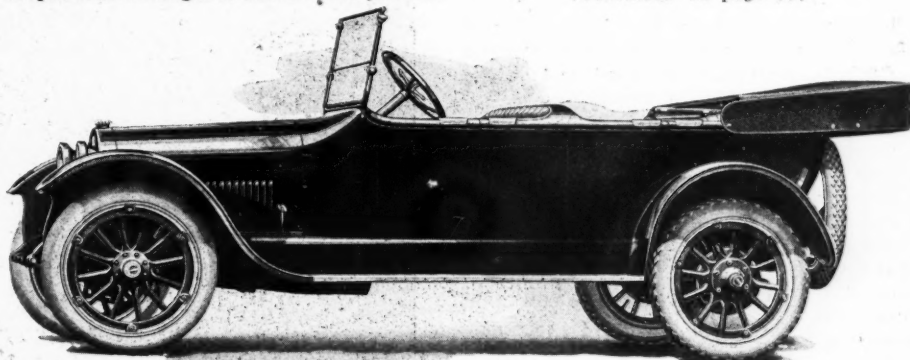
	K-45	K-49
Wheelbase	118 in.	124 in.
Bore and stroke. 3% by 4½	3% by 4½	3% by 4½
Electric system.... Delco	Delco	Delco
Tires	33 by 4	34 by 4½
Price	\$1,495	\$1,785

improvements on the battery include a cover designed to prevent leakage at the post, and the filler cap is arranged to prevent leakage of the electrolyte but

allow the escape of the gas. There are several other changes in the electrical equipment, none of which depart widely from previous practice. The headlamps are slightly different. The lighting and ignition switch has been changed and the angle of its mountings is slightly different to prevent interference when manipulated for night driving. The ammeter clamp is made of wood instead of metal to prevent any possibility of shorting.

The exterior appearance of the body is much the same, so the changes in it are not so readily noticeable. Generally, much heavier fabric materials are used

(Concluded on page 55)



The Buick seven-passenger and roadster for 1920

1920 Velie Handles Low-Grade Fuels

Engine Comes in for Greater Share of Changes—Appearance of Car Different Also

DECIDED improvements in the engine, an engine with an internally heated vaporizer for handling low grades of fuel, straight-line bodies, high cowl, new radiator and hood design, bevel border fenders, octagonal lamps, more leg room, wide doors, storage spaces and compartments in the seat backs, five body styles and a host of other improvements feature the new 1920 model Velie, built on a 115-in. wheelbase.

Although the car outwardly has been changed considerably, the engine has really come in for a greater share of attention. It is a new six-cylinder Continental, which superheats the gas before it enters the cylinders. The engine is more powerful than its predecessor, power being gained from the use of larger valves and a better co-ordination of the working parts. This is said to decrease the operating cost with better all-around efficiency. The engine has a four-bearing crankshaft, and all the bearings are bronze backed.

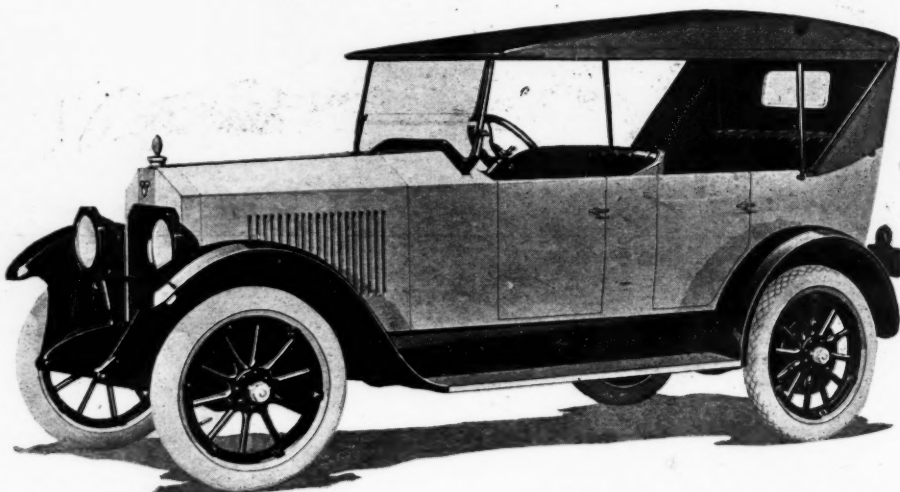
The smaller details have come in for their share of attention also. The gasoline tank has been enlarged and fitted with an improved filler. Soft spring oilers materially assist lubrication, and the chassis has been protected from mud and water by additional splash guards.

Accessibility of Valves

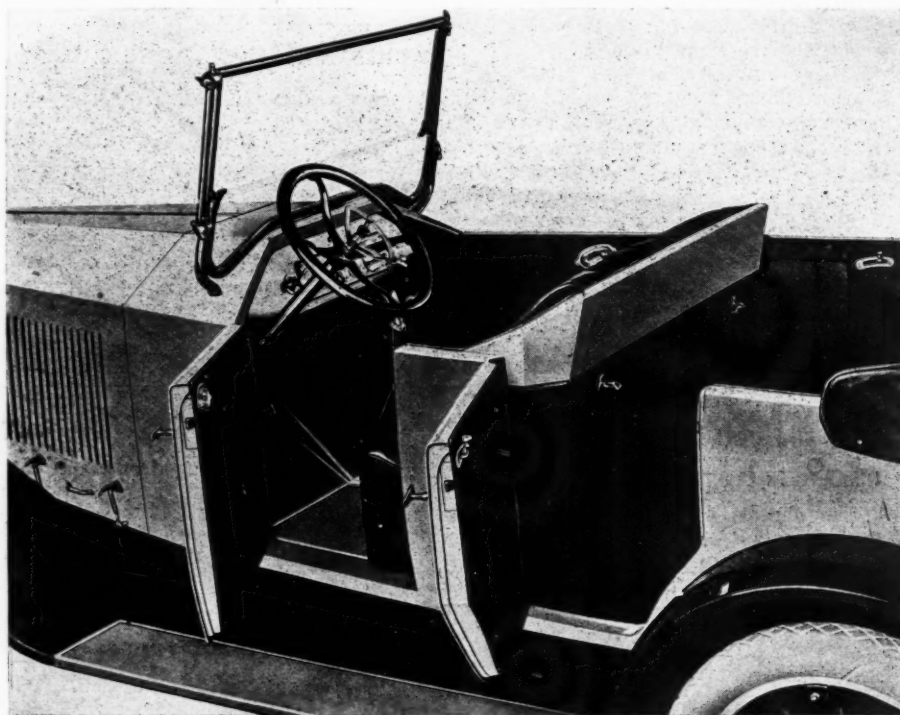
The engine is an in-block job, 3¼-in. bore, 4½-in. stroke, and has a removable head. The pistons are balanced and ground to size. The valves are on the side, completely inclosed, and have a high lift. They are accessible by removal of the hand cover plates. The pump and camshaft are driven by helical gears, and lubrication of the whole job is by a combined pressure and splash system through a hollow crankshaft. Oil pressure is supplied by a gear pump, and the oil is filtered continually. The crankcase is aluminum and so built that the pistons can be withdrawn from the bottom, a good maintenance and service feature. Ignition is by Atwater Kent system having semi-automatic spark advance. There is also a hand control on the steering wheel, giving advantage of both systems. Current is taken from a Willard 120-amp. hr. battery. The starting and lighting system is a two-unit Bijur outfit. All wiring is inclosed in metal conduits with fused junction boxes for inspections, another good maintenance feature.

The engine is pump cooled through a honeycomb type radiator of new shape. The fan is 18 in., belt-driven. The carburetor is a Rayfield, fuel being supplied from a 17-gal. tank on the rear by vacuum tank. An air adjustment is placed on the dash and the tank fitted with a gage.

The powerplant is unit type, having a



New 1920 model Velie touring car, which has a 115-in. wheelbase



View shows details of control and other features in 1920 Velie

Borg & Beck clutch and three-speed gearset. Two Arvac universal joints are used. Both front and rear axles are Timkens, the latter full-floating. No torque arms are used, as Hotchkiss drive is made use of. The frame is 4¼ in. deep and narrows toward the front to give a short turning radius. The front springs are semi-elliptic, 37 by 2 in. and the rear, three-quarters elliptic, 48 by 2 in. Both are underslung. For easier riding the springs are made up from many thin leaves rather than a few heavy thick leaves. The steering gear

is of the worm and wheel type, self-lubricating and fully adjustable. Both clutch and brake pedals are adjustable for position.

Other details include nickel-bound runningboards, flush louvres, leather upholstery, heavily enamelled metal work, tailored top and envelope, large plate glass in rear curtain, license plate carriers, motor-driven horn, robe rail, foot rail, full tool equipment, etc. The new Velie body styles include a touring car, two-passenger roadster, four-passenger sport, four-door sedan and coupe.

System for Heavy Fuel

Stewart-Warner Device to Handle Kerosene and Distillate by Vaporization

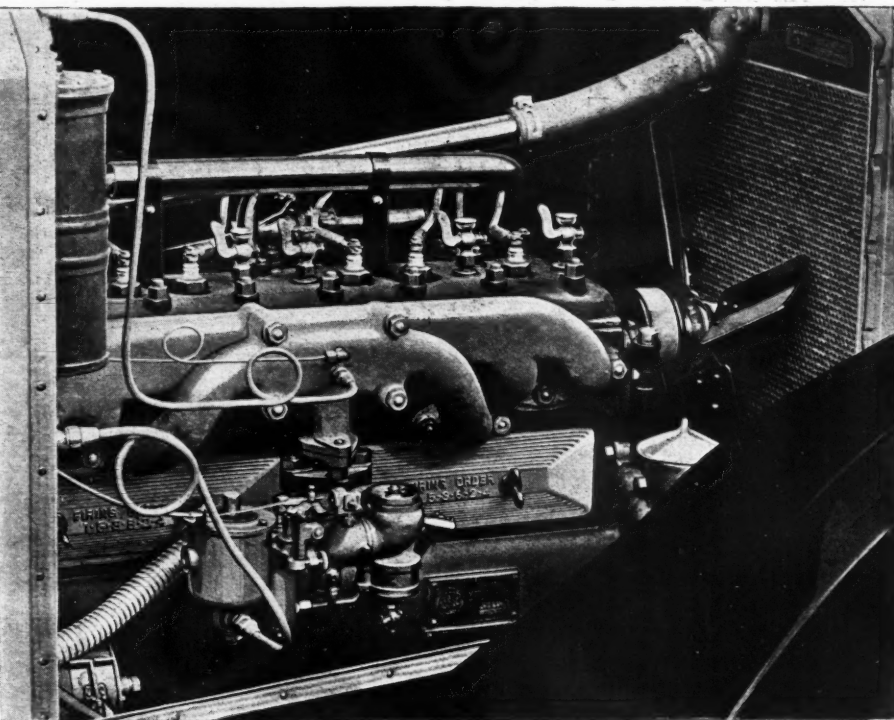
Method Used and Control of Temperature Described

H—that in a few words tells the story of the Stewart heavy fuel system, designed to bring about a measure of relief to the fuel situation. Unfortunately there are too many devices now on the market intended to cope with the low grades of fuel that get at the situation from the wrong end. In most cases the method consists of passing the gases from the carbureter through a very long length of heated passage where heat is given up to the fuel to cause it to vaporize. Heat is all right as far as the fuel is concerned, but the trouble is, the air going through the manifold also is heated to exactly that of the fuel. Air has not changed; it is just the same as it was centuries ago, but our fuels are getting ever heavier. Therefore is it not logical to leave the air alone and go after the fuel and treat it?

Briefly the greatest difficulty in carbureting heavy fuels is to divide them up finely enough to permit of their proper handling in the intake system and to make sure of their complete combustion within the small time available in the engine cycle. A liquid can only be divided when vaporized. No screens in the manifold or other mechanical devices whereby the liquid is dashed against comparatively cold surfaces can so finely divide a liquid. Vaporization is done only through a breaking down of the forces, which cause the molecules of the liquid to form into a continuous mass.

Fuel Finely Divided

In the Stewart heavy fuel system, made by the Stewart-Warner Speedometer Corp., Chicago, the fuel is initially finely divided mechanically at the carbureter spray nozzle. Naturally, at the spraying nozzle very high velocities are impressed upon the fuel globules. Advantage is taken of this fact in designing the chamber where the vaporization of



Engine which will be used by the 1920 Velie

the fuel takes place. The fuel globules after they leave the spray nozzle possess sufficient energy to cause them to leave the air stream and continue on into the exhaust heating vaporizing chamber. Thus only the fuel enters the chamber. The air does not enter, for, being so much lighter than the fuel, it is deflected by the manifold suction into the cylinder ports.

The vapor formed in the heated chamber flows out over the incoming fuel spray and gives up a portion of its heat directly to the liquid globules. In fact, the Stewart company points out that a considerable portion of the liquid most finely divided at the nozzle never reaches the heated surface, its vaporization being accomplished by the direct transfer of heat from vapor to liquid. In this way the temperature of the vapor as it leaves the neck of the vaporizer is never higher than that of the saturation at the pressure in the intake manifold, since the vapor always exists in the presence of its own liquid. When the vapor issues

from the heated chamber it condenses upon contact with the cool air of the mixture. This changes the temperature of the latter from that of the atmosphere by an amount slightly greater than the equivalent of the latent heat of vaporization of the fuel composing the vapor.

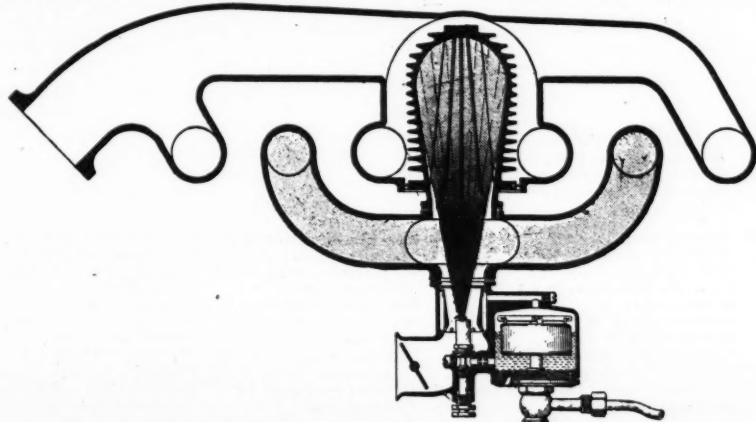
From the preceding it is quite obvious that the temperature of the mixture must be far below that of the corresponding mixture when such a mixture is formed by heating of the whole charge, as is done in many heavy fuel-burning devices on the market. It is said that the Stewart heavy fuel system has a constant value within a plus or minus 3 to 4 deg. Fahr., under all operating conditions from idling to full throttle opening. The only way whereby conditions can be changed so as to alter the mixture temperature is modification of the ratio of fuel to air in the mixture. Thus, a richer mixture or an increase in the fuel will cause a rise in the charge temperature, because more heat then is given up to the air by the fuel vapor. The converse is also true.

Naturally with any fuel vaporization device control of the vapor temperature becomes an important item.

The makers of the Stewart system call particular attention to the inherent control of the vapor temperature and therefore of the mixture temperature brought out in the preceding paragraph.

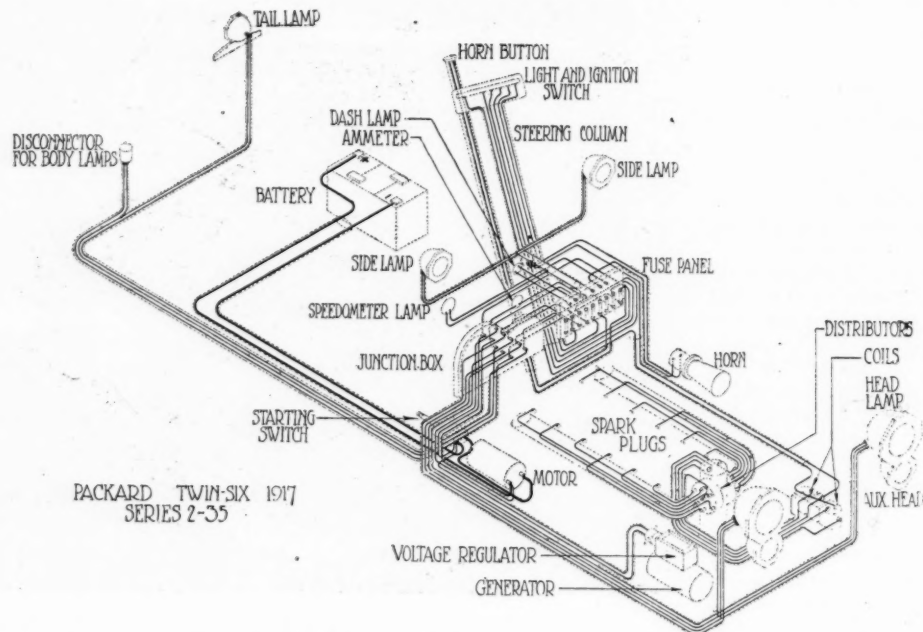
RENSHAW LEAVES STUDEBAKER

Cincinnati, Ohio, July 26—J. B. Renshaw, for more than four years connected with Studebaker as branch manager in South Bend, Atlanta and Cincinnati, has resigned. Mr. Renshaw has it in mind to become a dealer, although a location has not been definitely decided on.

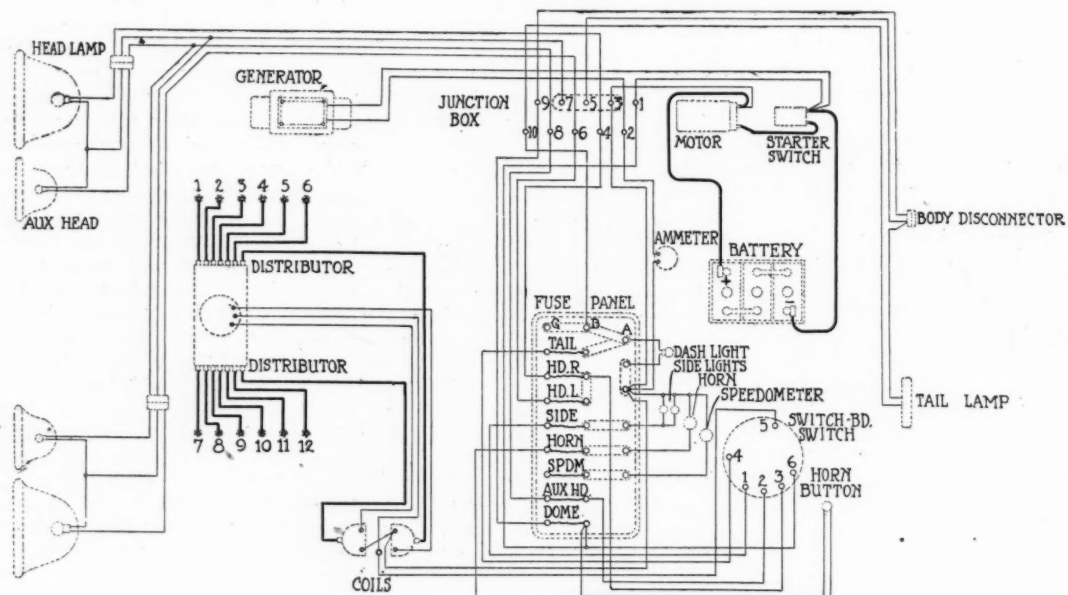


Cross-section of Stewart heavy fuel system

Motor Age Wiring Chart No. 39



Perspective diagram of Bijur installation on 1917 Packard with Delco ignition



Wiring diagram of Bijur installation on 1917 Packard

Special Systems for Fords—May 15-22
General Battery Charging—May 29
General Magneto Diagrams—June 5
Internal Connections—July 10-17-24

Abbott—March 20-27
Alco—April 24
Alter—Nov. 4
Apperson—March 6
Buick—Nov. 21-April 3
Cadillac—Dec. 9
Cartecar—May 1
Cole—Jan. 23-April 3
Case—Feb. 27
Chalmers—Feb. 20
Chandler—April 3

Chevrolet—Nov. 28-Mar. 27
Crow-Elkhart—June 26
Davis—May 8
Detroit—March 6
Dodge—Dec. 12
Dort—March 13
Elgin—Feb. 27
Empire—March 13
Ford—Jan. 30
Franklin—June 19
Grant—Feb. 27-March 27

Henderson—April 3
Hudson—Dec. 5-May 1
Hummobile—Feb. 13
Interstate—March 13
King—July 3
Kissel—July 3
Krit—Feb. 6
Lexington—April 24
Little—March 20
Locomobile—Jan. 23-April 17
Maxwell—Jan. 16

Marion—March 6-20
Mercer—Jan. 23
Michigan—March 20
Mitchell—Jan. 9
Murray—May 1
National—June 19
Oakland—Jan. 2
Oldsmobile—Jan. 23
Overland—Nov. 7-14
Packard—June 19
Paige—July 3
Paterson—June 26

Premier—April 10
Pullman—April 10
Regal—Feb. 6-April 10
Reo—Feb. 27
Saxon—April 17
Scripps-Booth—Dec. 26
Simplex—April 17
Stanley—June 26
Stearns-Knight—April 24
Studebaker—April 26
Velle—April 24
Westcott—May 8

Valve Timing

Motor Age Maintenance Data Sheet No. 47

One of a series of weekly pages of information valuable to service man and dealer—Save this page

Measured in Degrees and Minutes

1913 Cars

	Intake		Exhaust		Valve Clearance		Valve Stem		
	Opens After Upper Dead Center	Closes After Lower Dead Center	Opens Before Bottom Dead Center	Closes After Top Dead Center	Intake	Exhaust	Valve Diameter	Diameter	Length
Apperson	0	45	45	0	.343	.343	2.5	.4375	6 1/2
Cadillac	10	38-26	31-34	7-17	....	....	2 1/8	.4375	7 15/32
Case N	11-30	44-12	45-48	11-30	.004	.004	.004	.4375	7 29/32
Case O	13	30	50	13	.004	.004	.004	.375	6 5/16
Cole	17-30	61	29	14-30	....	....	....	....	....
Crawford	17-33	29-25	42-36	8-20	.003	.005	....	....	....
Crawford	11-30	44-12	45-48	11-30	.003	.005	....	....	....
Davis 40	11-30	44-12	45-48	11-30	....	....	....	....	....
Davis 50	17-53	29-25	42-36	8-20	....	....	....	....	....
Dorris H	10	30	45	15	....	....	1.6875	.4375	4 3/8
Ford	12-40	50-49	37-52	0	.025	.025	1.422	.3108	4.975
Franklin	†8	49	51-30	17	.010	.010	1.656	.277	5 11/32
Haynes	5	35	47	2	....	....	1.656	.4375	6 3/4
Hudson 37	10	33	40	2-30	.002	.002	1.781	.40625	6 11/16
Hudson 45	10	28	40	2-30	.002	.002	1.781	.40625	6 11/16
Hupmobile 32	25	35	40	20	.003	.003	1.25	.375	7 3/8
Lexington	10	28	40	2-30	.004	.004	1.781	.403	6 27/32
*Locomobile 48	0	‡5/16-3/8	‡11/16	‡1/8	....	....	2.125	.372	8 9/32
*Locomobile 38	0	‡1/8	‡3/4	‡1/8	....	....	2.125	.372	7 3/8
**McFarlan T	10	35	45	5 late	....	....	....	....	....
Mitchell	15	30	40	10	.005	.005	2.3125	.496	8 27/32
National M 36	12	45	50	10	....	....	2.75	.468	7 9/16
Oakland 35	15	38	45	10	.406	.406	1.5625	.4375	7 1/4
Oakland 42	15	38	45	10	.406	.406	1.765	.343	6 11/32
Oakland 60	15	38	46	10	.344	.344	1.765	.343	6 11/32
Overland 69	8	38	46	15	.012	.012	1.5625	1.8125	5 9/16
Overland 71	8	38	46	15	.012	.012	1.875	2.125	5 9/16
Packard 1-38	10	35	50	15	.003	.004	1.875	.375	6 15/32
Packard 2-48	10-27	34-58	49-33	14	.0025	.0035	2.0625	.4531	7 23/32
Paige 4-36	9-40	40-26	51-18	11	.003	.003	2	.373	7 9/16
Peerless 48-6	8-40	30-20	43-53	3-55	....	....	2.265	.433	8 7/8
*Premier 6-40	....	....	....	....	.005	.005	1.875	.435	5 3/4
Reo R	17-76	36-42	53-30	14-21	.004	.004	1.75	.375	4 19/64
Studebaker	12-30	32-30	45	7-30	....	....	1.75	.375	5 41/64
Winton 17D	....	....	....	....	....	....	2.25-2	.5625	6 9/16

*Marked on flywheel. †Before. ‡Inches piston travel. **Valves set by flywheel marks only; heel of cam not circular.

1914 Cars

	Intake		Exhaust		Valve Clearance		Valve Stem		
	Opens After Upper Dead Center	Closes After Lower Dead Center	Opens Before Bottom Dead Center	Closes After Top Dead Center	Intake	Exhaust	Valve Diameter	Diameter	Length
Abbott 34-40	11-30	44-12	45-48	11-30	....	....	....	....	....
Allen 40	15	40	45	10	....	....	....	....	....
Apperson 4-45 and 4-55	0	45	45	0	.343	.343	2.5	.4375	6 1/2
Apperson 6-55	0	45	45	0	.343	.343	2.25	.4365	6 15/16
Auburn 6-40 and 6-46	18	46	47	15	.003	.005	1.6875	.375	7 9/16
Briscoe A-15	0	40	47	5	.004	.004	1.625	.3720	5 31/32
Cadillac	10	38-26	31-34	7-17	....	....	2.125	.4375	7 9/32
Cameron	5	20	†50	10	....	....	....	....	....
Case O	13	30	50	13	.004	.004	2.3125	.4375	7 29/32
Case S	0	30	45	0	.004	.004	2.1875	.4375	7 13/32
Case R	0	30	45	0	.004	.004	1.84375	.375	6
Chalmers 24	12	33	55	12	.004	.004	2.1875	.4375	7 11/16
Chalmers 26	12	33	55	12	.0026	.0026	1.9375	.4375	6 13/16
Chevrolet H-2 and H-4	16-48.5	54-8.5	27-13	14-6.5	....	....	....	....	....
Corbitt	11	35	45	3	....	....	....	....	....
Correga H	10	39	49-30	12	....	....	....	....	....
Chandler	14	39	†49-30	12	....	....	....	....	....
Crawford	11-30	44-12	44-12	45-48	.003	.005	....	....	....

(Continued Next Week)

Service Equipment

Time Savers of the Shop



Sod-Tor-Lite self-heating soldering iron for battery repairmen

Sod-Tor-Lite

THE Sod-Tor-Lite self-heating soldering iron is a combination of an iron and a torch. The iron is equipped with three sets of points for all work on the motor car, such as radiator soldering, intricate electrical connection soldering and general soldering where a large amount of heat is required in the point. By removing the copper points the iron becomes a torch. The air adjustment is turned slightly to decrease the amount of air and this makes a luminous flame. The device is made by H. E. Hicken, Prairie Hill, Mo.

Illinois Battery Steamer

The battery steamer made by the Illinois Battery Steamer Co., Peoria, Ill., enables the battery repairman to take a cell out of a battery in about 4 minutes. The boiler of the steam is made of aluminum or copper and is fitted with a water gage. No iron is used in any part of this steamer. At the top of the tank are several steam cocks from which steam can be led to each cell of the battery. Because of the aluminum or copper boiler steam can be raised very quickly, it requiring only about 5 min. from cold to raise the few pounds of steam necessary, it is claimed.

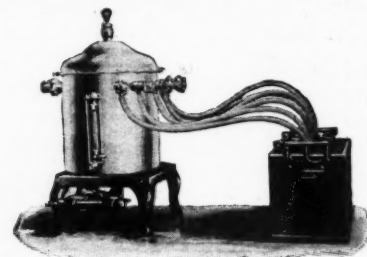
Battery of Oil Tanks

S. F. Bowser & Co., Inc., Fort Wayne, Ind., are making a combination oil supply system. These combination tanks are made from several units. Each one can be used to hold a different grade of oil. Each tank is fitted with an individual and accurate measuring device. To fill these units the barrel is rolled upon the filling rack, the rack hoisted to position and the barrel rolled over the desired tank.

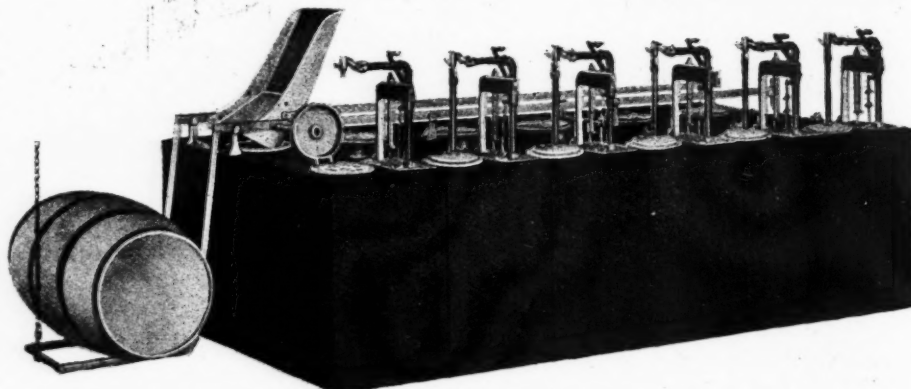
Testall Trouble Finder

The Testall trouble finder is an instrument designed to locate all electrical troubles in the starting, lighting or ignition systems of cars, airplanes, tractors or gas engines of any type. The instrument makes use of several well-known electrical principles and uses two meth-

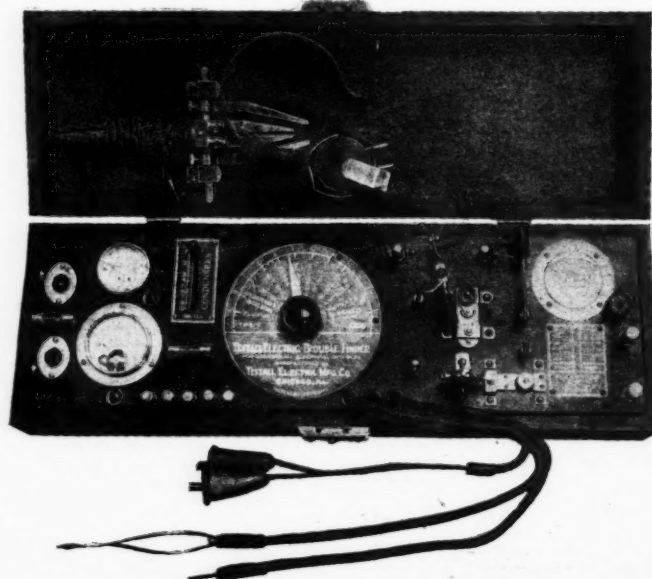
ods for locating electrical troubles. One of these methods is by the amount of deflection measured on a meter and the other by the length or intensity of the high-tension spark obtained from the coil or other apparatus to be tested. Among the things which can be tested with this outfit are: Armatures, High-tension mag-



Illinois battery steamer



Bowser battery of oil tanks, a combination of tanks in which each tank holds a different grade of oil



Testall trouble finding outfit for locating defects in starting, lighting and ignition systems on motor vehicles

The Accessory Corner

New Fitments for the Car

Small Car Wheel Bearings

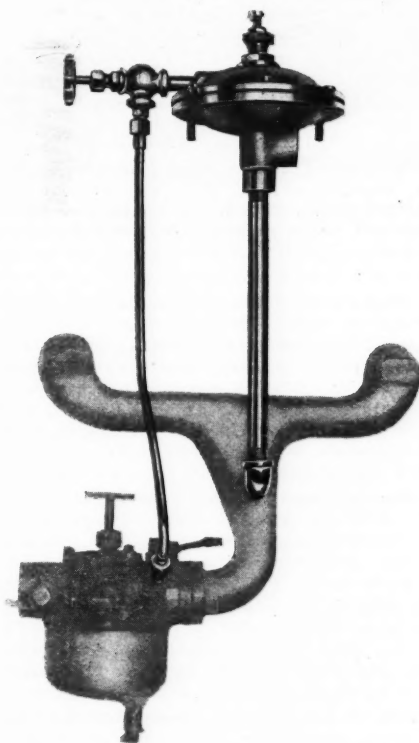
THE wheel bearings illustrated are for the front wheels of Fords and Chevrolets. The bearings have the advantage that if the wheel is out of adjustment the balls can not come out of the race and so pound themselves to pieces. The bearings are made by the Burgess-Norton Mfg. Co., Geneva, Ill., and sell for \$3.50 a set.

Duntley Timer

The Duntley timer for Ford cars and trucks and Fordson tractors approaches the timer question from a new angle, borrowing its idea from the magneto breaker. The breaker points are of tungsten, the contact being made by the hardened steel roller operating on a fiber roller. None of the parts on this timer requires lubrication. The maker, J. W. Duntley, 1004 Michigan avenue, Chicago, guarantees the timer for the life of the car on which it is installed. The timer is interchangeable with Ford parts, so no difficulty should be experienced in installing.

More Air Automatically

Many motorists have sought to introduce more air into their engines as the speeds increased, and usually this was done by putting some sort of valve in the intake manifold and manually opening it when the speed of the engine was sufficient to warrant it. But many times the operator forgot to open it and also to close it. By the device shown herewith, made by W. W. Johnson, Marshalltown, Iowa, the opening and closing of the



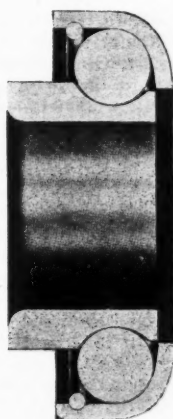
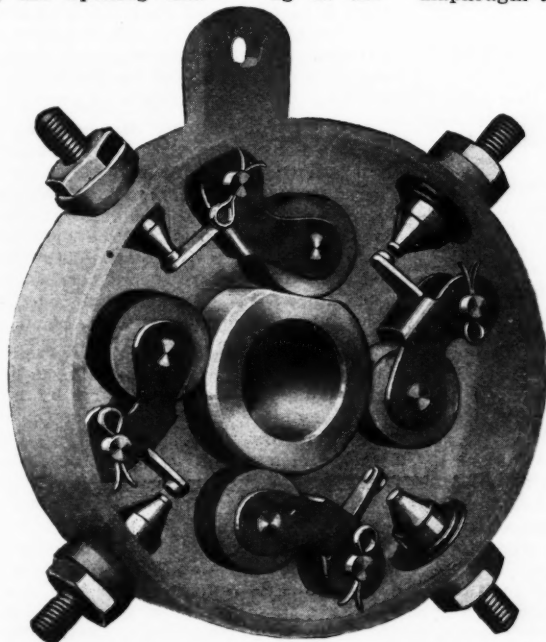
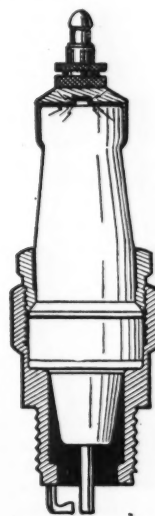
Johnson device for automatically controlling air inlet

auxiliary air inlet is done automatically and controlled by the throttle opening. The diaphragm at the top has attached to it a needle valve seating in the pipe running from the intake manifold to the diaphragm and on the other side of the

diaphragm is an adjustment screw to regulate the opening and closing of the valve. If the valve opens too soon for good low-speed performance, the tension on the diaphragm is increased. The connection at the bottom of the pipe running from carburetor to shut-off valve is placed behind the throttle butterfly so that at closed throttle there is no depression in this pipe and consequently no action on the needle valve.

Spark Plug With Intensifier

Instead of buying a spark plug and then intensifier later, one can now purchase spark plugs with a combined intensifier. The object of the self-contained intensifier is that the gap in the intensifier can be made equal to the gap at the spark plug terminals. The firing points on this particular plug are flattened so that the spark produced is in the form of a ribbon instead of the ordinary point-to-point spark. This is the Big Chief spark plug distributed by the Fleer-Petty Auto Accessories Co., Calumet Building, St. Louis, Mo.



Duntley timer, left; and wheel bearings for Fords and Chevrolets, below; right, spark plug with intensifier

Among the Makers and Dealers

Short Trade Notes

LOCKNUT Builder Buys Property—The Andrix Lock-Nut Co., Adrian, Mich., financed by Detroit and Adrian capital, has purchased the Austin & Rose planing mill property. Locknuts and motor car specialties will be manufactured.

Melhade Now in South America—Charles Melhade, who has been with the Republic Motor Truck Co. for four years, has been appointed sales manager for South America and the West Indies. He is now on a trip through South and Central America.

Pickett Joins Ohio Trailer—Harris N. Pickett, until recently advertising and assistant sales manager of the General Asbestos & Rubber Co., Charlestown, S. S., has been appointed advertising manager of the Ohio Trailer Co., Cleveland, Ohio.

Automobile Corp. Now in Toledo—The Automobile Corp. has moved its general offices from Fort Wayne, Ind., to Toledo, Ohio, and now are 40 miles nearer its factory, which is located at Napoleon, Ohio. Future plans include the erection of a set of modern factory buildings in Toledo, construction of which will start during the summer.

Vogler to Manage American Sales—Harold J. Vogler has been appointed general sales manager for the American Motor Truck Co., Newark, Ohio. Mr. Vogler has been general manager of the White service station in Philadelphia, Pa., since the war, having resigned as wholesale manager for Willys-Overland in the Metropolitan district to serve in the army.

Pope Settlement in October—Settlement of the Pope Mfg. Co. receivership, which has been in the courts for the last five and a half years, will go over until October. The matter came up before Judge Frank G. Haines in the superior court recently. A few dividend checks have not been returned, but when the matter is closed about \$75 will be left over. Dividends of 93.9 per cent have been paid to the creditors.

Gillette Getting Back to Capacity—The Gillette Rubber Co., Eau Claire, Wis., manufacturer of cord, fabric and solid tires, is rapidly getting back to capacity production after experiencing labor trouble for seven or eight weeks. While part of the force was on strike, work on a plant addition was prosecuted with vigor and within a very short time the capacity will show a large increase. Since organization the Gillette company has always had more orders than it could fill promptly but it now hopes to be able to relieve this condition.

To Sell Dodge in Atlanta Territory—D. E. Black and F. E. Maffett, two well-known motor car men of Atlanta, Ga., have organized the firm of Black & Maffett to distribute Dodge Brothers cars in the Atlanta territory. They occupy one of the best buildings on Atlanta's row. Mr. Maffett has been connected with the Dodge Brothers agency in Atlanta almost continuously for ten years and is reputed to have sold the first Dodge Brothers car sold in that territory. They will maintain a modern

equipped service station in connection with their salesrooms and offices.

Aurand Is Claudel Chief Engineer—A. E. Aurand has been appointed chief engineer of the Claudel Carburetor Co. Mr. Aurand was formerly designing engineer for the Zenith Carburetor Corp.

Warner Is Nelson Chief Engineer—Cecil B. Warner is now chief engineer of the Nelson Motor Truck Co., Saginaw, Mich. For five years he was connected with the engineering staff of the Gramm-Bernstein Motor Truck Co., Lima, Ohio.

Wiens Now With Body Builder—Raymond A. Wiens, Racine, Wis., has been elected secretary and treasurer of the Racine Mfg. Co., manufacturer of motor car bodies. Mr. Wiens was secretary of the old Mitchell Wagon Co., Racine, and when this interest was consolidated with the present Mitchell Motors Co. he handled the liquidation of the concern.

Experimental Yankee Boy Tractors—The Phoenix Mfg. Co., Eau Claire, Wis. is constructing a new type of tractor under contract with the Yankee Boy Tractor Corp. The machines now in process will be used for demonstrations. The Yankee Boy intends to open a factory of its own before the end of the year. The new tractor is a three- to four-plow design, using kerosene as fuel.

Heil to Specialize in Dump Bodies—The Heil Co., Milwaukee, Wis., tank and boiler manufacturing concern, is specializing in the production of dump bodies of all kinds, with hydraulic hoisting equipment, for application to trucks. It will continue, however, to make welded tanks of all kinds. The dump body and hoist line is the outgrowth of war work operations of this character. During the war, one of the principal contracts of the Heil Co. was to build welded tanks for the Eagle type of submarine chaser constructed by Ford. About 8,000 of these tanks were made in all, the production having reached fifty a day.

Pioneer Dealer Disposes of One Line—Emil Hokanson, one of the pioneers among Buick dealers, has disposed of the Hokanson-Buick Co., Madison, Wis., to devote his entire time to the general management of the Wisconsin Oakland Co., Milwaukee, distributor of the Oakland in Wisconsin and Upper Michigan. Mr. Hokanson acquired this concern on Jan. 1, since which time the management has been in the hands of William N. Thompson, a member of the Hokanson concern since 1906. Mr. Thompson will continue to be associated with Mr. Hokanson in the Oakland distribution. B. E. Lawton, Zala Baldwin and Harry C. Henderson of Madison take over the business of the Hokanson-Buick Co. and will occupy the same quarters at Madison. Emil Hokanson is a younger brother of Rudolph Hokanson, general manager of the Nash Sales Co., Milwaukee. The Hokanson brothers worked in garages in Milwaukee from 1902 to 1904, going to Madison to open one of the first garages and repair shops there. There were made Buick dealers in 1905. In 1917 Rudolph Hokanson disposed of his interests to

take over the Nash field work, and his younger brother now goes back to Milwaukee to take over the Oakland distribution.

Peoria Tractor Buys Factory Site—The Peoria Tractor Co., recently re-incorporated in Iowa with several Des Moines capitalists as stockholders, has purchased a site for the new factory which will be built at Des Moines.

Trade in Buffalo Is Booming Too—Recent Buffalo building permits include one for a \$28,000 addition to the plant of the Atterbury Motor Truck Corp. and another for \$10,000 showroom and service station for John Dehn.

Dealer Adds Service Station—Elmer Tuttle, Antigo, Wis., Grant six dealer, is enlarging his business to include general repair and service station, having erected a new fireproof building for this purpose. This will be conducted as the Service Automobile Co.

To Distribute Oakland in Detroit Territory—Products of the Oakland Motor Car Co. will be distributed in Detroit and surrounding counties by the Detroit Oakland Co. The new firm is headed by Frank J. Miller, who has opened a sales and service station.

To Distribute Jordan in Wisconsin—The Wisconsin Motor Car Co., Milwaukee, Wis., has been organized to become distributor of the Jordan in Wisconsin and Upper Michigan. The partners are H. M. Glover, O. C. Heffinger and Edward Bluthardt. F. A. Colare has been named sales manager, and Fred Goode will be manager of the wholesale department.

G. M. St. Louis Expansion Begins—Building permits have been issued for three buildings for the St. Louis Mfg. Corp. St. Louis, Mo., subsidiary of General Motors. The cost of each of two buildings is \$808,000, and each is three stories, of concrete and 300 by 720 ft. The third building is for administration purposes, and is three stories, 40 by 120 ft., to cost \$57,600. Work is to begin at once.

Mullins Body Corp. Reorganizes—The Mullins Body Corp., Salem, Ohio, has been reorganized with a stock of \$1,000,000 preferred and \$70,000 common. The company manufactured bodies, fenders and parts for Packard, Cadillac, Pierce-Arrow, Locomobile, Peerless, Stearns and the Baker electric. The company has been in business since 1904, having then succeeded a business originated in 1871.

Modern Garage Planned for Pontiac—Arthur S. Widrig, Pontiac, Mich., is building a double garage that is 120 by 140 ft. When complete it will be one of the most modern of its kind in the city. It will have an ornamental pattern-pressed brick front with large display windows, showrooms and general and private offices in front with the rear of steel, glass and reinforced concrete construction. The floors in the offices and showrooms will be of mosaic tile. A feature will be the electrically controlled doors, which will open and close by pressure of a button. While the building will be one-story on Perry street the fall in the grade is so great

toward Hill street the latter elevation will be almost two stories and cars can be driven from the street down inclines to the basement, making it possible to utilize all the basement floor for garage purposes.

Canadian Ford Pays Another Dividend—The Ford Motor Co., of Canada, has paid a dividend of 10 per cent on all stock of record July 16. This dividend makes a total of 25 per cent paid so far this year by this company.

Miller Now With Holt—George H. Miller, superintendent of the milling division of the Reo Motor Car Co., has resigned and goes with the Holt Mfg. Co., Peoria, Ill., as general superintendent. Mr. Miller joined the Reo organization in 1910.

Thirty-Eight Cars in Garage Burn—The Ohio Garage & Auto Parts Co., Toledo, Ohio, was practically destroyed by fire recently. Forty-one cars were in the establishment at the time and only three were saved.

Munro Returns to Agency—W. J. Munro, assistant advertising manager of the General Motors Truck Co., has resigned to return to his position with the Green-Fulton-Cunningham Co., which handles the advertising of the G. M. C. truck.

To Sell Anderson Car Also—The Advance Motor Sales Corp., Philadelphia, Pa., which recently took on the Elgin, has closed for the distribution in that territory of the Anderson, manufactured at Rock Hill, S. C., by the Anderson Motor Co.

Jackson Will Succeed Webster—H. G. Jackson, formerly Detroit representative of the Wire Wheel Corp. of America, will succeed Ralph D. Webster as general sales manager. Mr. Webster resigned to become associated with the F. E. Castle Co., Detroit.

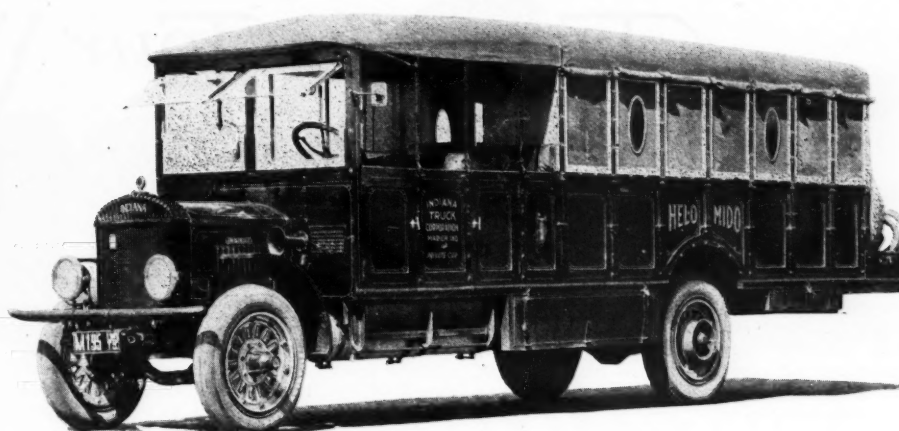
Stetson Will Represent Tank Builder—R. M. Stetson, formerly with the Packard and Maxwell companies as Detroit representative, has been appointed Detroit representative of the Yardell Brothers Co., Utica, N. Y., builder of gasoline tanks for motor cars.

Parker Heads Braender Branch—The new branch manager of the Braender Rubber & Tire Co., Philadelphia, Pa., is R. B. Parker, formerly assistant manager of the same branch. E. J. Smullen, former manager of the Philadelphia branch, has resigned to take the agency for the Standard eight in Chester, Pa.

Savold Tire Starts New York Plant—The Savold Tire Corp., incorporated in several states to rebuild used tires by a new process, has placed in operation its New York factory. So far only experimental work is being done, with a comparatively small force of employees, but quantity production will be undertaken probably next month, it is expected.

Lansing Body Is Expanding—The Lansing Body Co., Lansing, Mich., is progressing well with a building campaign which will mean a larger payroll and production increase. Additional units call for an expenditure of \$50,000. One building is now under construction. It is 80 by 100 ft. The new unit will house the paint and varnish department. The company is making a specialty of bus, hearse and delivery bodies.

Pressman Tire Establishes Branches—The Pressman Tire & Rubber Co., recently incorporated, has established eight branches in eastern cities, as follows: Boston, Baltimore, Harrisburg, Scranton, Wilkes-Barre, Easton, Allentown and main temporary headquarters, Philadel-



PULLMAN IDEA ADAPTED TO TRUCK—This vehicle was built by the Indiana Motor Truck Corp., Marion, Ind. The interior resembles that of a sleeping car with berths, etc., and is a complete private car

phia. Other cities in which branches soon will be established are New York, Pittsburgh, Chicago, Cleveland, Detroit, St. Louis and San Francisco. A hundred branch stores are expected to be in operation within a year.

Chrysler Goes to Hurlburt Factory—P. C. Chrysler, formerly manager of the Philadelphia branch of the Hurlburt Motor Truck Co., has been appointed director of the wholesale department of Hurlburt Motors, Inc., the new company formed to take over the sale and distribution of Hurlburt trucks.

To Build Tires at Warren—The D. & M Cord Tire Co., Warren, Ohio, has been organized by local business men with an authorized capital of \$300,000 to manufacture tires and tubes. The plant will be located in Warren, and it is expected to spend \$200,000 on the buildings and equipment. W. E. Myers of Cleveland has been selected president of the company.

Blackhawk Tire Commences Factory—The Blackhawk Tire Co., Des Moines, Iowa, has started work on the first unit of its factory for the manufacture of tires and tubes. The first unit is to be two stories and basement, 320 by 640 ft. It will cost \$150,000. Officers of the com-

pany are: William Moran, Granger, Iowa, president; John F. Griffin, Des Moines, vice-president; J. J. O'Malley, Des Moines, treasurer, and E. A. Lewis, Des Moines, secretary.

Cascade Tire Is Launched—The Cascade Tire & Rubber Co., Ravenna, Ohio, has been organized with an authorized capital of \$1,000,000 to manufacture cord and solid tires and tubes of all kinds. It is planned to start soon the erection of a \$50,000 plant in Ravenna, which is expected to be ready for operation about Nov. 1.

New Concern Buys Garage—The Hope Motor Co., recently organized in Atlanta, Ga., to distribute Selden trucks, has secured the buildings and equipment of the Rutland & Morton Garage, which they will use as sales and service station. George M., Jr., and Welborne Hope, owners and active managers of this concern are now in the automotive field, but both are mechanical engineers, recently discharged from the Army.

To Distribute Stephens in Georgia—The Newkirk-George Motor Co. has been organized in Atlanta, Ga., to distribute Stephens cars in Georgia. Bryant Newkirk was formerly sales manager for the Joseph G. Blount Co., of Atlanta, and Homer George is well known in racing circles, where he has been identified as promoter and publicity agent for many years. He was at one time press agent for Barney Oldfield.

Stewart Distributer Adds to Territory—The Parsons Motor Corp., Atlanta, Ga., distributor for Stewart trucks in Georgia, Florida, Alabama, Mississippi and Tennessee, have been awarded the Stewart franchise for the Carolinas in addition to present territory. This firm was organized last January with a capital stock of \$100,000. It maintains a large stock of spare parts and a modern service station. A highly skilled service man is kept in the territory with dealers all the time.

Pennsylvania Rubber Builds Homes—Because of the shortage of housing for employees, the Pennsylvania Rubber Co. is building a model town of 600 dwellings on the 120-acre tract immediately south of its plant. The homes are to be of stucco and brick. Twelve have been completed and thirty-three more are now in course of construction. They will be in readiness for occupancy by November. There will be a community center, athletic park, schoolhouse and well-laid streets.

BUICK MODELS FOR 1920

(Concluded from page 47)

throughout. Anti-rattling features have been added at every possible rattle-producing point. The hinges on the doors are designed to be rattle-proof; a heavier and stiffer spring in the hood helps to do away with rattles at his point.

In appointments and finish there are several refinements in the coupe model. These include a combination knuckle door hinge of heavier design, windows which can be removed without removing the trimming, lower seats and cushions with a more comfortable triangular auxiliary seat, pilot sidelights on the redesigned cowl, touring car design side aprons and runningboards and a new windshield with an improved locking device on the rain vision feature.

A complete list of the prices of the various models follow:

K-44 three-passenger roadster.....	\$1,495
K-45 five-passenger touring.....	1,495
K-46 five-passenger touring coupe.....	2,085
K-47 five-passenger touring sedan.....	2,255
K-49 seven-passenger touring car.....	1,785
K-50 seven-passenger sedan.....	2,695

From the Four Winds

Glimpses at the World of Motordom

GASOLINE Pumps Licensed Here—All gasoline pumps in Connecticut must, according to the new state law, be registered. A small license plate similar to that used on cars is issued by the commissioner of motor vehicles at a cost of \$2. The plate bears the license number and the year.

Michigan Licenses May Total 300,000—Michigan will license more than 300,000 cars this year, it is expected. The state department has issued 284,902 licenses as compared with 262,125 last year and 160,052 in 1916. Three years ago the state department licensed 682 dealers and manufacturers, while so far this year 915 licenses of this class have been granted.

Would Make Road Model Section—Transformation of the 40-mile stretch of the Lincoln highway from upper Sandusky west through Hancock county into the model section of the transcontinental roadway is the plan of the Lincoln Highway Association. This is the longest stretch on the entire road, as a result of the change eliminating Hardin county and Lima in Ohio. Plans include making the road 60 feet wide, building special fences along each side, planting trees and arranging lawns attractively.

In the Wake of John Barleycorn—A Hartford garageman was rather surprised this week to receive a request for a pint of denatured alcohol. He sold it to a fellow who was not using a car but thought nothing of it until the stranger came back in the afternoon and wanted another pint. A chance remark brought the situation to light. Prohibition or no the fellow had to have a drink, but he did not get the second one.

\$3,000,000 for Roads of One County—Plans for the improvement of roads in St. Louis County, Missouri, have been enlarged by the designation of four such roads as state roads by the highway commission. The total mileage of the roads so designated is 58.85 miles. Several years ago the county voted for

and issued \$3,000,000 in bonds for permanent roads. One taxpayer held up the sale of the bonds through court action, and the matter was taken by him to the United States Supreme Court, the bonds finally being upheld. The estimated cost of the building of the roads designated as state roads is \$1,400,000. With the Government bearing half of this expense, the county will have \$2,300,000 of the bond issue remaining for expenditure on other roads.

Counties to Vote on Road Issues—Counties in Missouri are awakening to the need of good roads. Aug. 18 has been fixed as the date for an election in Livingston county on a \$1,200,000 issue for the building of permanent roads. The following day an election will be held in Linn County to decide on a \$1,000,000 issue. A petition for a \$750,000 bond issue is now being circulated in Audrain County. The county court of Monroe County has ordered an election Aug. 2 for a \$1,000,000 bond issue. Marion County will vote Aug. 12 on a \$1,500,000 issue.

Who Got the Worst of It?—Some peculiar things happen within Connecticut, widely known as the land of steady habits, and the following is one: A doctor was driving his car, accompanied by a fair companion. A bumblebee alighted on the lady and while she and the doctor were trying to dislodge the insect, the car swerved and collided with a kettle of hot tar which had been prepared by some of the city employees. The hot tar was splattered on two of the men and they had to be removed to the hospital for treatment.

Traffic Governors "Reckless" Definition—There is no such thing as a speed law in Connecticut now. One is reckless. This fact has been clearly set forth by the commissioner of motor vehicles, who emphasizes the feature of the law which compels a driver to proceed with caution. His speed is obviously governed by traffic. If he goes through a town 30 m.p.h., he is reckless; if he sails at 60 m.p.h.

on a clear road with nothing in sight he is not reckless. An accident is clearly prima facie evidence of recklessness. It is worthy of note that the law is being generally respected. The police force of the commissioner's department is vigilant and is covering the state for violations. Glaring headlights are among other phases demanding attention. A department official is to all intents and purposes an aid of the state police and has larger powers than in the past.

Would Have Owner's Name Displayed—An ordinance has been introduced in the city council of St. Louis, Mo., requiring the names of owners to be affixed in letters at least 3 in. high on all motor cars, trucks, wagons and other vehicles used for commercial purposes, the purpose of the measure being to prevent the theft of such vehicles.

Limit for Parking Set at 20 Min.—Some Hartford owners are prone to inquire if the old town is slipping back to the famed blue law days by reason of the decision of the city government to make the time limit for cars in the business section 20 min. instead of 40 as at present. Streets heretofore unrestricted come in under the ban, and an undesirable state of affairs is anticipated, especially by those who have used their cars for business pure and simple. The city's contention is that 20 min. is long enough to leave cars on any of the busiest streets.

Wisconsin Commission to Regulate Lighting—The Wisconsin legislature has passed to the industrial commission of Wisconsin the responsibility of fixing reasonable standards of lighting equipment of motor vehicles instead of making regulations as part of the state motor code. The commission is empowered to issue general or special orders determining the adjustment and use of lighting equipment on motor cars. However, no change is made in the motor code, which requires front lights adequate to enable the driver to clearly distinguish persons or other substantial objects 200 feet ahead, but prohibits glaring headlights.

How Henry Was Converted to Tractor—J. L. Henry, a farmer near Woodson, Ill., who has long been famous for his confidence in mules in taking care of his farm work, has been won over to a tractor. When his wheat was ready to cut this month he started the binder with four of his animals. Due to much rain and several storms, the wheat was down and badly tangled. The weather was hot, in addition. The mules pulled faithfully but could not make headway. In desperation, Henry hastened to town and invested in a Fordson. He turned his four mules out to pasture and then commenced work with his tractor. The first day he cut 20 acres in 8 hr. 25 min. and in a few days the tractor did the work the mules could not perform. The farmer was so delighted with the success of his machine he invested in a 22-36 thresher to finish the job. It was operated with the tractor and the mules are still in the pasture.

COMING MOTOR EVENTS

TRACTOR DEMONSTRATIONS

Piqua, Ohio	Ohio State University	Aug. 1-2
Fostoria, Ohio	Ohio State University	Aug. 6-7
Akron, Ohio	Ohio State University	Aug. 12-13
Aberdeen, S. D.	Sectional Tractor Demonstration	Aug. 18-22

RACES

Ottawa, Ontario	Tractor and Farm Machinery	Oct. 14-16
Elgin, Ill.	Road Race	Aug. 23
Uniontown, Pa.	Speedway	Sept. 1
New York	Speedway	Sept. 20
Cincinnati, Ohio	Speedway	Oct. 1

SHOWS

Indianapolis, Ind.	Automobile Trade Association	Sept. 1-6
Cincinnati, Ohio	Automobile Dealers' Association	Sept. 13-20
Springfield, Mass.	Eastern States Exposition	Sept. 15-20
New York	N. A. C. C.	Jan. 3-10
Chicago	N. A. C. C.	Jan. 24-31

Buda

Automotive Engines

Especially among truck and tractor users, the name Buda, stands for an engine that is unusually long-lived, due of course to uncommon sturdiness of construction and design.

The policy of The Buda Company has been consistently one of quality rather than of quantity.

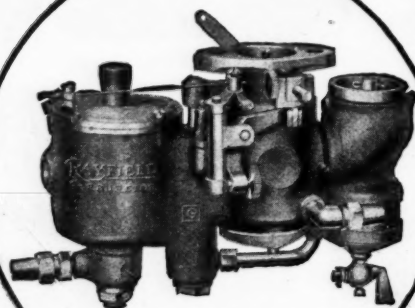
In adopting the Buda Engine, unchanged in all its essentials, for the severest war service, the United States Government expressed its approval of this policy.

Men who sell Buda-equipped trucks and tractors tell us that prospects usually accept without question, the quality of the engine,

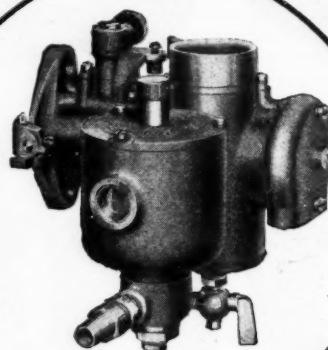
This selling ease may be yours, if you will insist, as many other alert dealers have done before you, that the truck you sell be Buda-equipped.

THE BUDA COMPANY, Harvey (Chicago Suburb), Ill.

Rayfield Leadership Acknowledged by Engineers for Ten Years



MODEL G



MODEL M

Rayfield Carburetors have always been considered by the motoring public as representing the highest standards in carburetor performance.

There are sound reasons for this Rayfield supremacy.

Motorists have found that a car equipped with a Rayfield not only performs better but operates more economically over a period of months.

The big underlying reason for this performance is that in design the Rayfield is mechanically correct. It is this perfection which gives you more

miles per gallon. It sends your car to the front in crowded traffic and carries it over hills and through sand without hesitation.

The Rayfield Carburetor at its price represents an unusual carburetor value. Dealers and car owners everywhere who have experienced a new satisfaction in motoring with a decrease in expense, constantly testify to the fact that Rayfield represents greater economy in the long run.

Distributors and Service Stations everywhere.

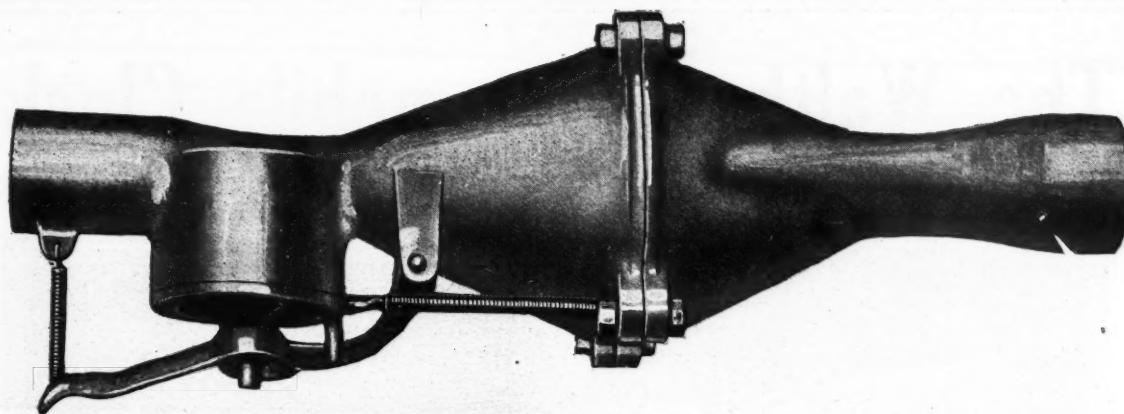
BENEKE & KROPF MANUFACTURING CO.

Successors to Findeisen & Kropf Manufacturing Co.

21st and Rockwell Streets, Chicago, Illinois

RAYFIELD

CARBURETORS



This is the New



Combined Muffler and Cut-Out for Chevrolet and Maxwell Cars

It combines every feature a good Muffler ought to have with a special, cast-in, self-cleaning Cut-Out, or Engine Testing Valve.

It reduces Back Pressure to a minimum.

It brings a surprising amount of New Power and Extra Miles out of every pint of Gasoline.

It won't rattle.

It CAN'T blow out.

No special mechanical knowledge is required to install it. Full directions are on every package.

THE TABER is unconditionally guaranteed for the life of the car.

DEALERS!

Here is an item that will turn over a small investment many times during the year. We help you sell it. Write or wire for full information, or better still, send that initial order NOW and start right in making good profits filling the demand in your district. Please mention the name of your favorite Jobber.

PRICE \$5.50
COMPLETE

\$5.75 West of the Rockies

EMCO MANUFACTURING COMPANY, INC.
48 COURT STREET BINGHAMTON, N. Y.

THE

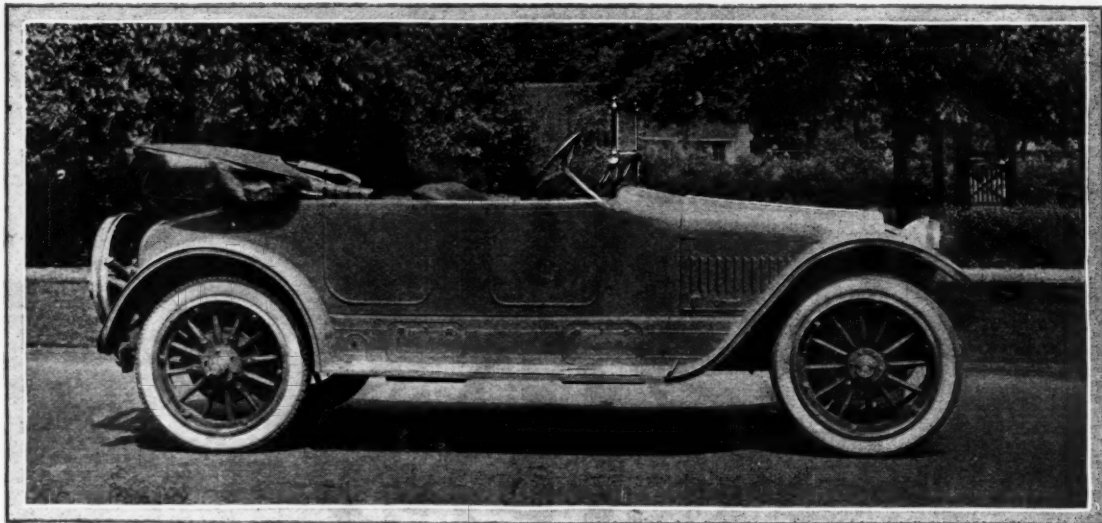


BOTH A

**MUFFLER
& CUTOUT**

The Waltham Automobile Clock

More Than a Quarter Million Now in Use as Standard Equipment



*Winton 6-33 Four Passenger Roadster
Equipped with Waltham Automobile Clock*

It isn't enough that your automobile clock should keep good time under ordinary travel conditions. To be really valuable it must tell the right time all the time.

And a Waltham Automobile Clock can be relied upon to do this because it is scientifically constructed to withstand road shocks and changes of temperature.

It has a jeweled eight day movement, two mainsprings, and a winding indicator which flashes a red signal on the dial every seventh day.

The superiority of the Waltham Automobile Clock has led to its adoption as standard equipment by the makers of the fine cars listed on this page.

WALTHAM WATCH COMPANY
WALTHAM, MASS.



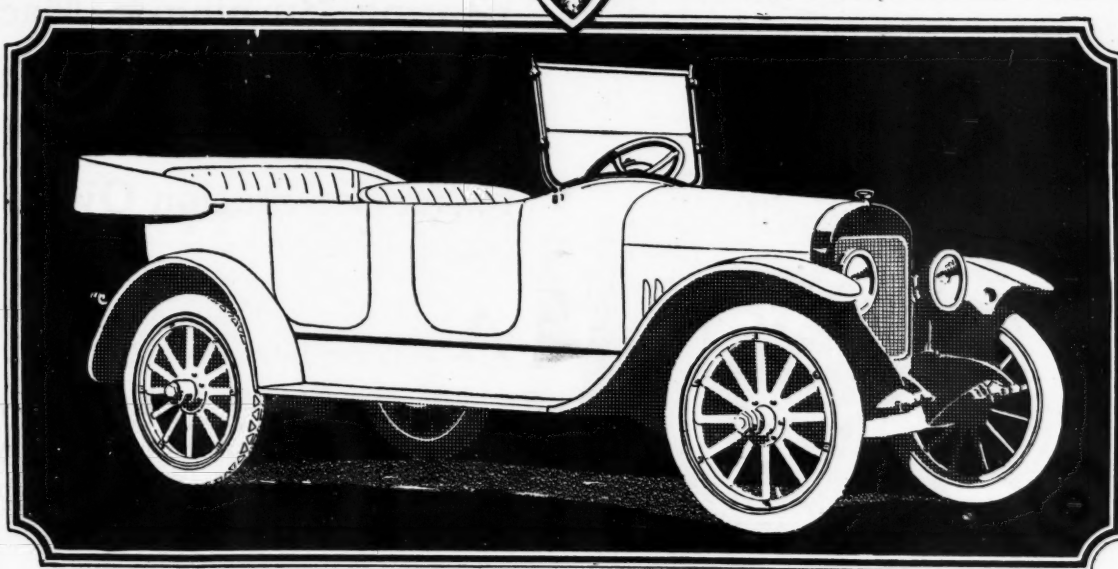
Waltham Model F

List of Cars carrying Waltham Clocks as standard equipment

Anderson 6-40	Franklin	Merced
Apperson	Haynes	Owen-Magnetic
Brewster	Hollier	Packard
Cadillac	Hudson Super-Six	Pierce-Arrow
Cole	Jordan	Rauch & Lang
Cunningham	Kissel	Studebaker
Detroit-Electric	Locomobile	Willis-Overland
Dorris	Marmon	Winton

WALTHAM

THE WORLD'S WATCH OVER TIME



Easy Access to All Chassis Units

Motorists instantly appreciate the excellences of the Crow-Elkhart chassis—the “spider” clutch housing, the easy access to all chassis units, the frictionless universal joint construction. They recognize an evidence of notable saving in the Multi-powered motor’s limited capacity for fuel consumption, and an assurance of tire economy in the Crow-Elkhart’s light weight.

CROW-ELKHART Multi-Powered

Crow-Elkhart 1920 Six—5 Pass. Touring Car, \$1545; 1919 Six—5 Pass. Touring, \$1345; Six—2 Pass. Roadster, \$1345; Six—5 Pass. DeLuxe Tourster, \$1405; Six—4 Pass. DeLuxe Roadster, \$1405; Crow-Elkhart Four—5 Pass. Touring, \$1145; Four—2 Pass. Roadster, \$1145; Four—5 Pass. DeLuxe Tourster, \$1205; Four—4 Pass. DeLuxe Roadster, \$1205.

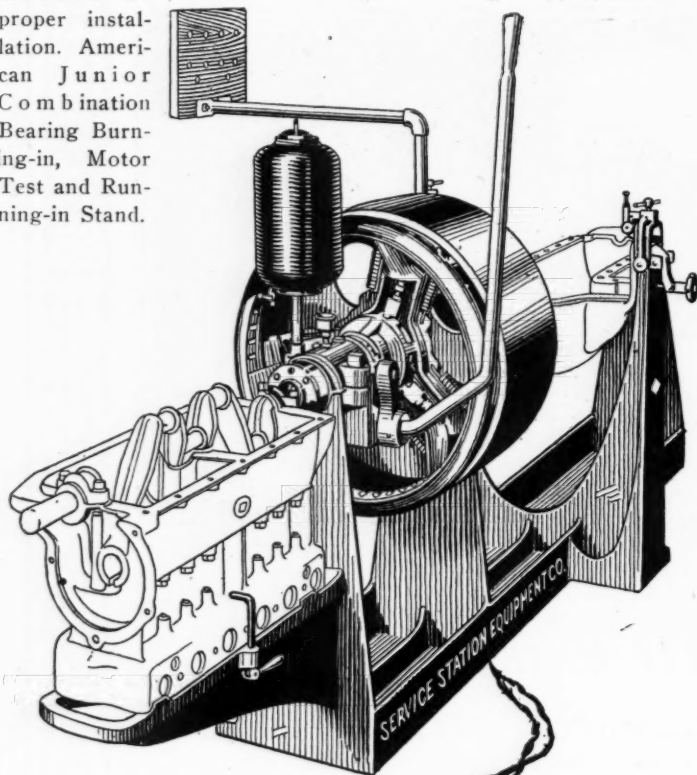
WRITE FOR CATALOG CONTAINING FULL INFORMATION

CROW-ELKHART MOTOR CORPORATION, Dept. 101, ELKHART, INDIANA

Export Department, Broadway at 53rd St., New York City, U. S. A.

DEALERS will immediately recognize the new opportunity that the Crow-Elkhart Multi-Powered Line offers. Desirable territory is still open. Write today for particulars about our attractive dealer franchise.

\$197.50 F.O.B. Chicago, including gasoline tank, coil box holder, water connections and a set of blue prints showing method of proper installation. American Junior Combination Bearing Burning-in, Motor Test and Running-in Stand.



\$197.50

F.O.B. Chicago



This mark is our guarantee and your protection.

Bearing Burning-in Machines —Better Ford Motor Bearings at Lower Costs—More Profits to Service Station Owners.

ACTUAL shop experimenting has shown that the Bearing Burning-in Machines sold by The Fairbanks Company save 5 to 7 hours on refitting Ford motor bearings.

This means a big saving in money and more profits.

When the job is finished by the burning-in process you have 95% perfect bearing surface.

It takes 6 to 9 hours to hand scrape a set of Ford motor bearings, and the best average is only 40% perfect bearing surface.

Already 3000 Ford Service Stations in America and many others in South America, South Africa and England are equipped with these labor-saving machines. They have all realized greater profits and their customers have been better satisfied.

Do not fail to give these machines your closest consideration. The initial cost is small. The equipment soon pays for itself.

Write today to the nearest Fairbanks Branch House and ask for catalogue.

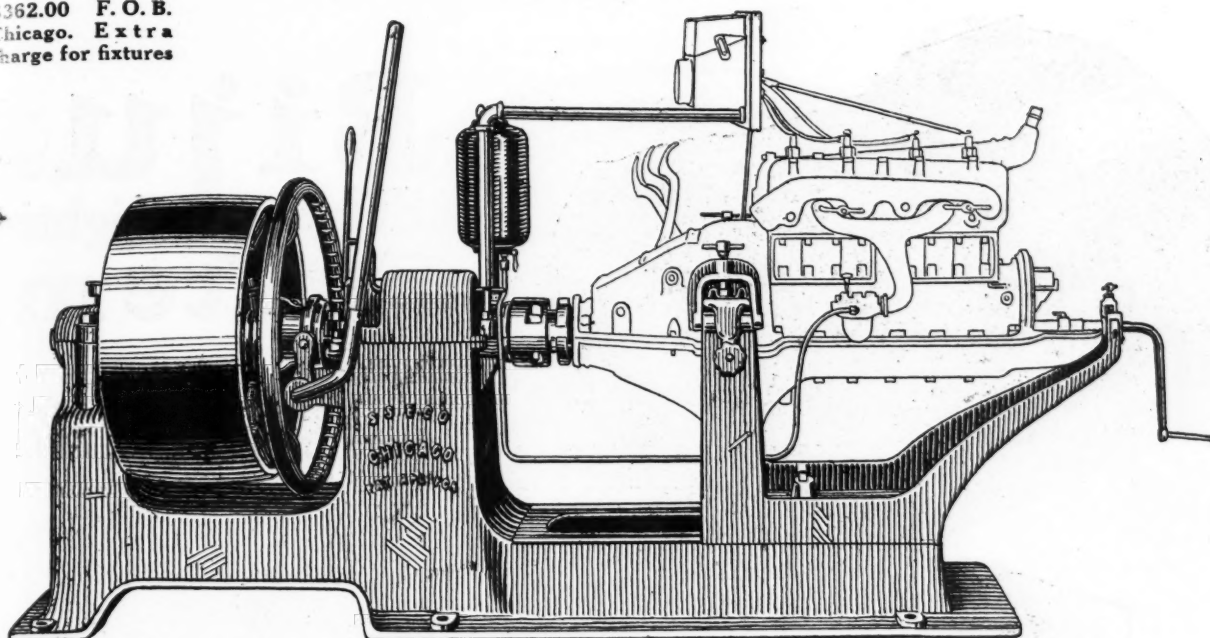
The
FAIRBANKS
Sole Distributors for the
SERVICE STATION EQUIPMENT CO., CHICAGO, ILL.
Company



MILL, MINE AND RAILWAY SUPPLIES, SCALES, VALVES, POWER TRANSMISSION, TRUCKS AND WHEELBARROWS

When Writing to Advertisers, Please Mention Motor Age

\$362.00 F. O. B.
Chicago. Extra
charge for fixtures



American Universal Bearing Burning-in Motor Test and Running-in Stand. The illustration shows the machine with fixture for running-in and testing assembled Ford motors. This machine is used also for burning-in the bearings on Ford motors, in upright position or up-side-down \$362.00 F. O. B. Chicago, without fixtures. Extra charge for necessary fixtures for burning-in, running-in and block testing Ford and Fordson motors.

These machines are sold under "THE FAIRBANKS COMPANY O. K."

All Service Station Equipment machines are manufactured by the Service Station Equipment Co. of Chicago and sold under "The Fairbanks Company O. K."

This means that only the finest material and highest grade workmanship are used on these machines.

Every one is tested and found to be right. "The Fairbanks Company O. K." is your protection. Use it.

THE FAIRBANKS COMPANY
Administrative Offices—NEW YORK

Branch Houses

Albany	Buffalo	London, England	Paterson	Scranton
Baltimore	Chicago	Newark	Philadelphia	St. Louis
Birmingham	Detroit	New Orleans	Pittsburgh	Syracuse
Birmingham, England	Glasgow, Scotland	New York	Providence	Utica
Boston	Hartford	Paris, France	Rochester	Washington
Bridgeport	Havana, Cuba			

Here is a list of these profit making machines and tools:

Bearing Burning-in Machines
Motor Test Stands
Rear Axle Test Stands
Sleeve Pullers
Turning Bars
Bench Motor Clamps
Piston Clamps
Boring Machines
Re-Babbiting Jigs
Air Compressors
Arbor Presses
Connecting Rod
Straightening Jigs
L Wrenches
Speed Wrenches
Reamers
Straightening Presses

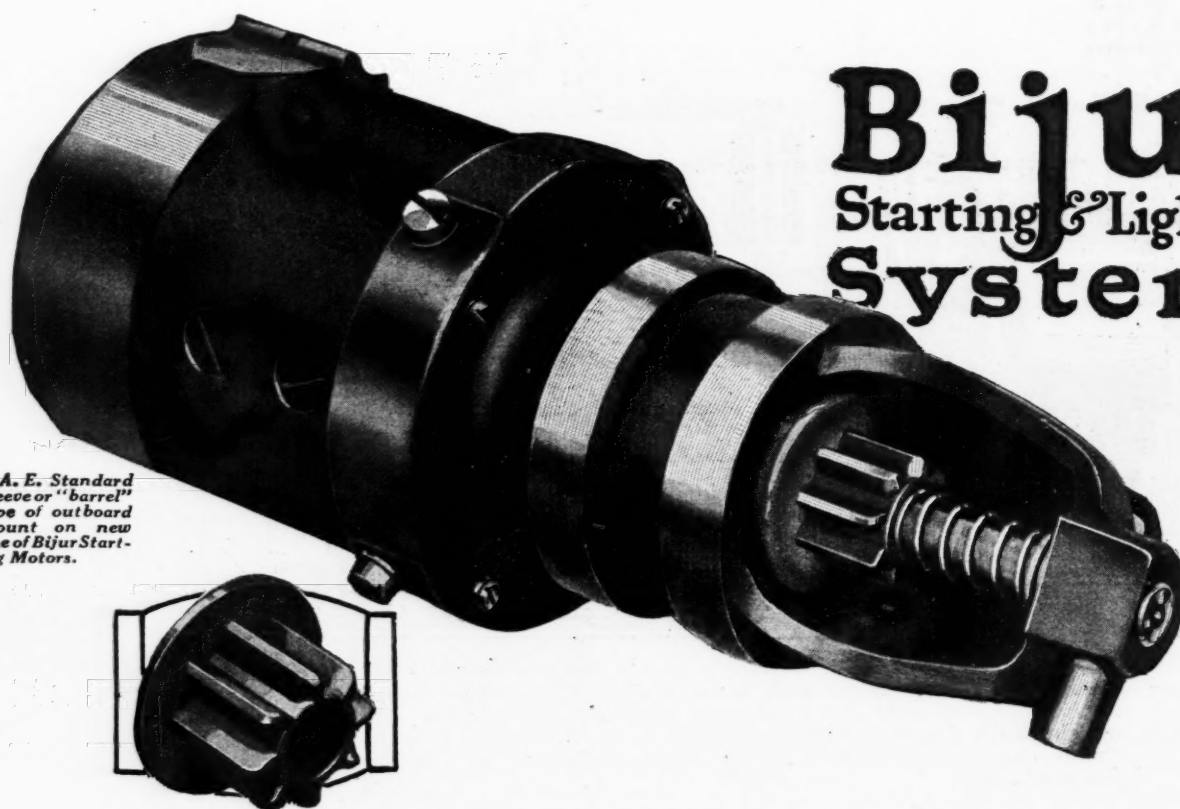
Tractor Tools and special machinery for Ford and Fordson

The
FAIRBANKS
Sole Distributors for the
SERVICE STATION EQUIPMENT CO., CHICAGO, ILL.
Company



MACHINE TOOLS, ENGINES AND PUMPS, AUTOMOBILE AND SERVICE STATION EQUIPMENT

When Writing to Advertisers Please Mention Motor Age



S. A. E. Standard Sleeve or "barrel" type of outboard mount on new line of Bijur Starting Motors.

Bijur

Starting & Lighting Systems

An 8 Tooth Starting Pinion. A New Development in the Automobile Field.

The new line of Bijur starters incorporates an innovation in the automobile field.

The eight tooth pinion, having demonstrated its value and reliability on seaplanes and dirigibles, is now available in standard equipments for modern automobile engines.

This development, made possible by the unique design of the Bijur direct screw shift, means an increase of approximately 28% in the starting effect, the motor remaining the same size as heretofore.

Standard forms of pinion teeth are used to accommodate standard fly wheels. The S.A.E. standard "barrel" type of outboard mount has also been incorporated in the new design.

While the new design is particularly applicable to the modern light six engine, it may be adapted for use on the entire line.

This line of starters includes the well known non-jamming, back fire and fly-wheel-breaking prevention features found only in the Bijur direct automatic shift design.

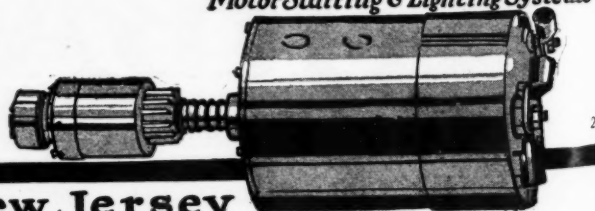
Bijur Motor Appliance Company

Hoboken



New Jersey

Motor Starting & Lighting Systems



When Writing to Advertisers, Please Mention Motor Age

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S



tems

10 to 1

Ten talking points in favor of

CARLISLE

**Tires to One in Favor of the ordinary tire.
Which are you selling?**

ORDINARY pneumatics are so near alike that a salesman or a dealer is at his wits' end to dig up even one good sales argument.

With the Carlisle there are dozens of excellent arguments. The reason is that the tire is utterly different from anything else made of cotton and rubber.

Just a few good selling points that help Carlisle dealers to sell hard prospects :

Built on specially invented machines
Rope carcass
Unbroken strands
Each strand individually inspected
Breaking resistance of each strand
235 pounds
Each strand insulated
No two strands touch or rub
Internal friction abolished
Cool at 60 miles an hour
All strands under perfectly uniform
tension
Astonishingly resilient
Make a car "ride differently"
Save wear and tear on car mechanism
Cut repair bills

Increase gasoline mileage
Retreading advocated
Blowouts almost unknown
Loose treads unknown
Sand blisters unknown
All usual run of tire troubles practically unknown
100 pounds friction pull (against 18 to 30 in the ordinary tire)
Lightning Tread—something more than a good looking non-skid
Easiest riding tire ever built
Likewise the fastest tire
Shock absorbers can be thrown away
Built for rough usage
Prices reasonable

CARLISLE CORD TIRE COMPANY, Inc., Andover, Mass.

Save Hours of Tiresome Grinding

CONSERVE time and labor,—increase shop efficiency twenty times over and thereby reduce your overhead and increase your profits by refacing and reseating valves the efficient **Sioux Way**.

SIoux REAMER Insures accurate grinding of valve seats. Makes perfect fitting valves in one-twentieth the time required by the old method. Is absolutely accurate. Note how reamer shank keeps reamer perfectly centered and insures accurate cutting.

SIoux REFACING TOOL Applies same principle and smooths the face of the valve in short order. Works like a miniature lathe. A few turns fits the valve perfectly to the valve seat.

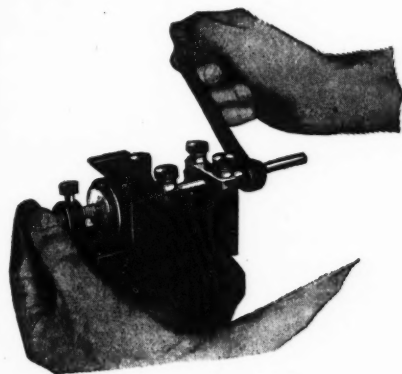
SIoux SERVICE We keep Sioux Tools ground and sharpened. All you pay is transportation charges. Workmanship and material guaranteed.

Your Jobber Sells Sioux Tools

ALBERTSON & CO.

—:-

SIoux CITY, IA.

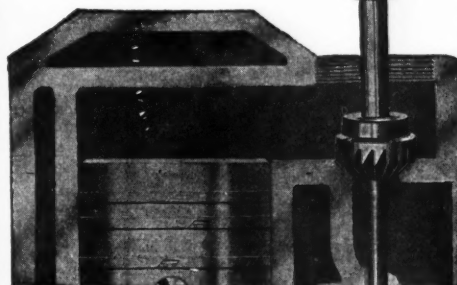


PATENTED
FEB. 17, 1914 NOV. 26, 1918

**Refacing
Tool**



Reamer



PATENTED
FEB. 17, 1914 NOV. 26, 1913

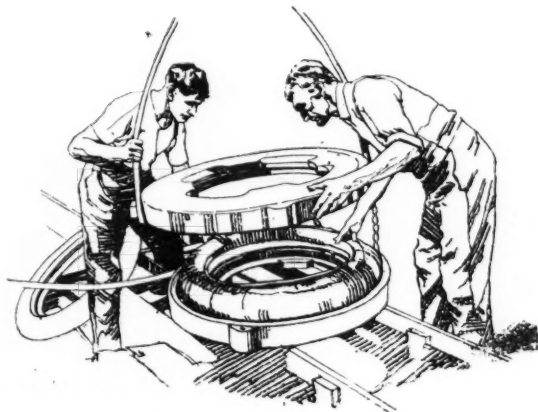
Men In The Tire Industry Have Predicted That Some Day Someone Would Find A Way To Banish Blowouts, Rim Cuts And Fabric Bruises Caused By Structural Defects.

Right!

The way has been found

The New Principle—Curing

BY INTERNAL HYDRAULIC EXPANSION



Do you know what happens to a soft, uncured tire, on an inflexible iron core, when squeezed between the jaws of a heavy iron mold under an **EXTERNAL** pressure of 150,000 to 300,000 pounds?

THE average tire, after being built up, ply by ply, on a solid iron core, is placed in the lower half of a heavy mold, with the inflexible iron core still in it.

In order to fill out the depressions in the mold which form the non-skid tread design, the tire must carry an excess amount of tread stock, causing it to overlap the edge of the mold.

Consequently, when the upper half of the mold is placed in position it fails to make contact with the lower half. The two halves are then brought together under a crushing pressure of 150,000 to 300,000 lbs.

Mold Pinch

Often some little fault in assembling will cause the tire to seat improperly in the mold, then when the mold is pressed together, the fabric becomes pinched or "buckled"—a weak-

ness which seldom shows externally in the finished tire, but shows quickly enough in a sudden blowout while the tire is yet practically new.

Fabric Bruise

When the fabric becomes crushed in spots—crowded out of place under mold pressure—it forms a bruise on the inside of the carcass. This is caused by the fabric being pulled into a thinner gauge to make room for other stock finding a level, or crowded into a thicker gauge to fill out a light spot in the carcass.

The peculiar effect of this condition is to cause a blowout in the tire while the tread is still intact.

Like mold pinch, a fabric bruise may give no external evidence of its existence—the tire may *look* sound enough—yet blow out suddenly after only a few miles of driving.

While tire manufacturers undoubt-

edly take every possible means to prevent such conditions, there is no way absolutely to avoid them so long as tires are built on an inflexible core and cured under external pressure.

Rim Cut

Another case of distortion under pressure—in clincher and Q. D. clincher tires. The bead is displaced from its proper position and is crowded up into the side wall of the tire.

When the tire is inflated, the air pressure exerted against the fabric causes it to tear strand by strand between the hook in the bead and the lower part of the side wall.

In straight side tires the mold pressure frequently pushes the wire braid or cables out of place—sometimes right up into the side wall. Then the wire cannot function as an anchor on the rim, and the tire is blown off when in use.

ALL BANISHED BY INTERNAL EXPANSION HYDRAULIC CURING



Mold Pinch—The layers of fabric have been crowded out of shape due to the terrific pressure necessary to close the mold. This defect is very difficult to detect. The tire may run for hundreds of miles and then "blow out" without warning.



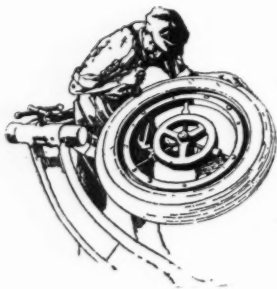
Rim Cut—The soft rubber bead has been crowded up into the side wall of the tire during its manufacture. When in use, the air pressure will pull against the fabric causing it to tear between the hook on the bead and the lower part of the side wall.



Fabric Bruise—The fabric becomes crushed in spots due to being crowded into the mold under pressure.

IN Curing the National Speedway Tire, Pressure Is Not Necessary To Close the Mold.

Pressure is applied afterward—hydraulically—from the inside



The Collapsible Core

Instead of using a solid iron core, the National Speedway Tire is built up on a collapsible core—one that can be taken apart and removed without destroying the shape of the uncured tire after assembling.

The Mold

The Mold is of heavy two-piece construction, like other molds, but made large enough to accommodate the uncured tire and close completely around it without any pressure. This is because the actual curing pressure is applied *internally* when the mold is placed in the vulcanizing kettle.

Internal Hydraulic Pressure

This is a wholly unique process evolved by the makers of National Speedway Tires. A spe



cially constructed inner tube—of the exact dimension and shape of the inside of finished casing—is placed in the tire, and then subjected to a hydraulic pressure of 200 lbs. to the square inch. This pressure is maintained during the whole period of curing. Distortion and pinching are impossible.

Guarantee—6000 Miles

A finished National Speedway Tire is flawless—absolutely certain to deliver its full 6000 miles of guaranteed service and a big margin beyond.

Since the discovery of this new method, National Speedway adjustments have averaged not more than one in every 2000 tires sold.

Curing by Internal Hydraulic Expansion

None of the defects common to other makes of tires can possibly creep in.

Every square inch of material is the finest grade obtainable. The tread is thicker than the requirements call for—having a greater rubber content than any other tire on the market, with but one possible exception. Yet National Speedway Tires are very light and resilient.

Though the National Speedway process is more expensive than the methods employed by other manufacturers, the resultant elimination of "seconds" and adjustments has so considerably reduced costs that we have been able to list National Speedway Tires lower than others of similar rating.

Structurally Perfect—

YET NOTE THE MODERATE PRICES

30x3½	.....	\$22.75	34x4	.....	38.25
32x3½	.....	26.10	34x4½	.....	50.40
31x4	.....	34.85	35x4½	.....	51.30
32x4	.....	35.50	36x4½	.....	52.20
33x4	.....	37.10	35x5	.....	60.00
			37x5	.....	63.00

INQUIRE ON YOUR LETTERHEAD

If you are ready to talk business in real earnest we have something to tell you about tire profits and financial help.

How many tire manufacturers really make it worth the dealer's while to get out and hustle? If you are dealing with such a one—stick to him!

But if not—we have worked out an unusual proposition that will give you a greater profit and more real financial help than you have ever had before.

If you have the spirit to go in and win—we want you. That is more important to us than big capital. Show us what you are made of and we will give you the necessary financial co-operation.

With a *trouble-proof* tire to work with you have a chance to make big money on an increasing scale. You will have a generous share of all profits, on a practical partnership basis.

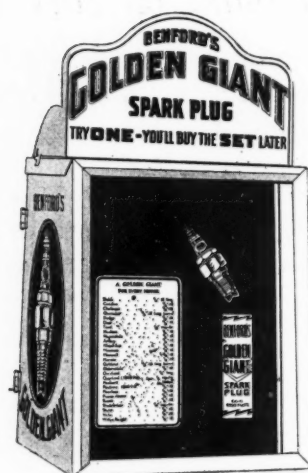
Your adjustments should be negligible—one in every 2000 tires sold. In all probability none. Just ask for details—and judge for yourself.

NATIONAL RUBBER PRODUCTS CORP.

660-662 North Broad St., National Rubber Co. Bldg.
Philadelphia, Pa.



Golden Giants Are Back on the i



Your Customers know
that Golden Giants
are Distinguished by
their Coat of Pure Gold

BENFORD'S

ir Pre-War Basis

THE same good quality that made Golden Giants the leader in more than 40,000 garages and accessory shops before the war is being built into Golden Giants again to-day.

They are even better than before. The Porcelain is tabooed forever—and we offer you now the Golden Giant built with the FAMOUS BLUE ADAMANT CORE. Blue Adamant cannot even be disturbed by heat—and hard knocks have no effect on it whatsoever.

We are proud of the plug we are building to-day—so proud that we shall shout about Golden Giants in all the trade papers and in many national mediums. WE SHALL MAKE YOUR CUSTOMERS KNOW OF GOLDEN GIANT QUALITY THROUGH THESE ADVERTISEMENTS.

Get behind Golden Giants NOW, Mr. Dealer. Use our sales helps to co-operate with Golden Giant advertising and get your share of this profitable business.

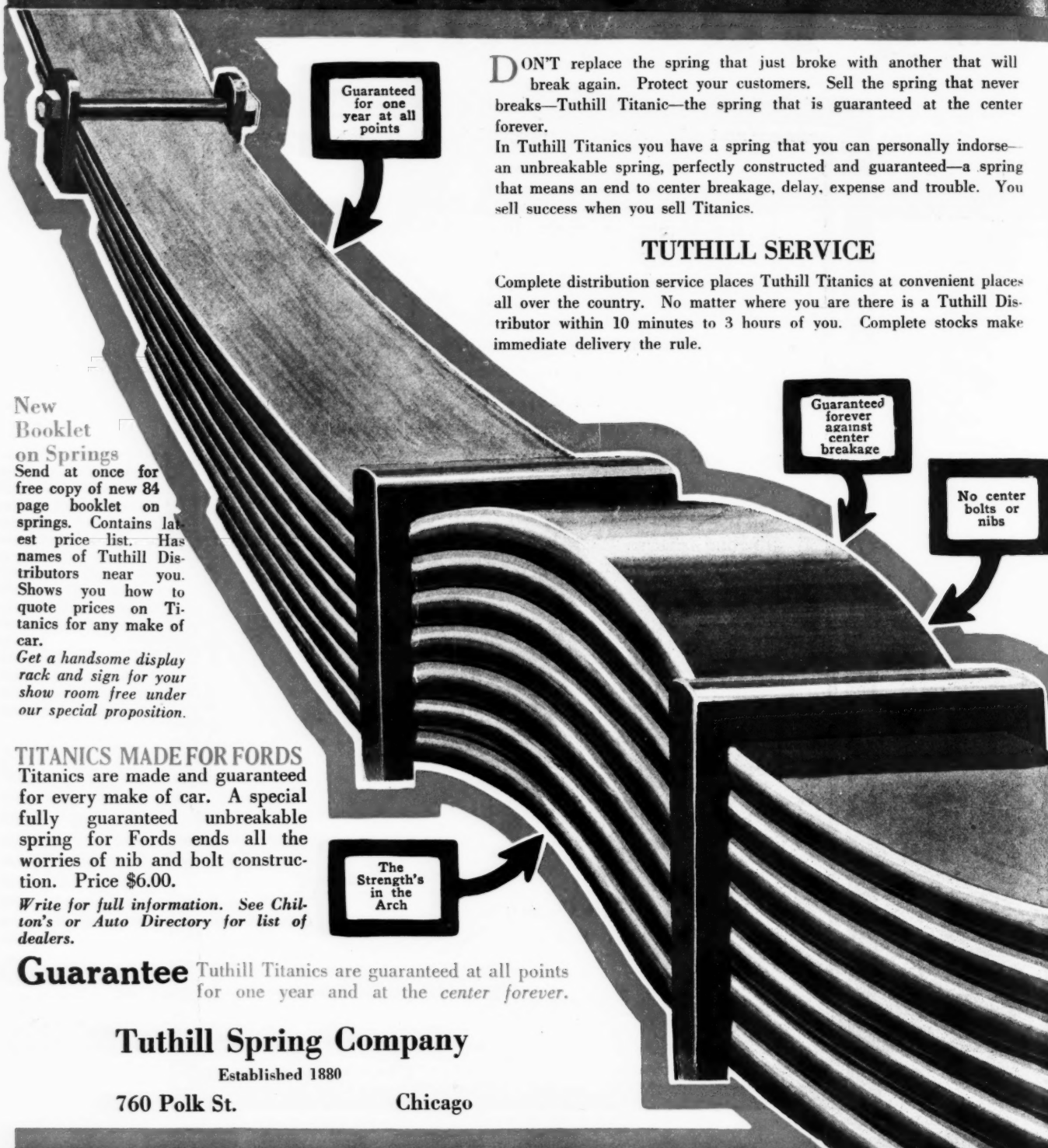
The cabinet pictured at the left holds and displays Golden Giants. It is free with an order for 100 plugs or more.

The Golden Giant Is
A Business Builder

Benford Mfg. Co. Mt. Vernon, N. Y.

GOLDEN GIANT

STOP selling springs that BREAK



Guaranteed
for one
year at all
points

DON'T replace the spring that just broke with another that will break again. Protect your customers. Sell the spring that never breaks—Tuthill Titanic—the spring that is guaranteed at the center forever.

In Tuthill Titanics you have a spring that you can personally indorse—an unbreakable spring, perfectly constructed and guaranteed—a spring that means an end to center breakage, delay, expense and trouble. You sell success when you sell Titanics.

TUTHILL SERVICE

Complete distribution service places Tuthill Titanics at convenient places all over the country. No matter where you are there is a Tuthill Distributor within 10 minutes to 3 hours of you. Complete stocks make immediate delivery the rule.

New Booklet

on Springs
Send at once for free copy of new 84 page booklet on springs. Contains latest price list. Has names of Tuthill Distributors near you. Shows you how to quote prices on Titanics for any make of car.

Get a handsome display rack and sign for your show room free under our special proposition.

TITANICS MADE FOR FORDS

Titanics are made and guaranteed for every make of car. A special fully guaranteed unbreakable spring for Fords ends all the worries of nib and bolt construction. Price \$6.00.

Write for full information. See Chilton's or Auto Directory for list of dealers.

The
Strength's
in the
Arch

Guaranteed
forever
against
center
breakage

No center
bolts or
nibs

Guarantee Tuthill Titanics are guaranteed at all points for one year and at the center forever.

Tuthill Spring Company

Established 1880

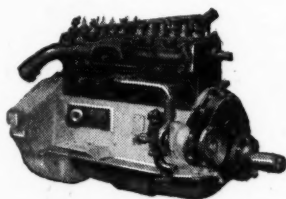
760 Polk St.

Chicago

**Guaranteed for ever
while it lasts**



The Red Seal Continental Motor Is the Feature She Looks for First



America's Standard Passenger Car Motor. Look for the Red Seal Nameplate.

Today, when economy and sureness of operation are of primary importance, the man or woman who buys an automobile gives first attention to the motor.

Unless the motor is satisfactory, all else in a motor car goes for naught. More than that, the motor's merit must be proved in advance. The buyer must be sure of its power, its speed, its silence, and above all its dependability.

That is why the buyer most often looks first for the Red Seal Continental Motor. The Continental's record of past performance—its 100 per cent dependability has

been proved by hundreds of thousands of owners during more than a decade and a half.

Hence the Red Seal Continental Motor is the choice of more than 165 successful manufacturers of passenger cars and trucks. Upwards of 15,000 dealers base their business prosperity on Continental-powered cars. Of a large portion of the great motor vehicle industry Continental is the very foundation.

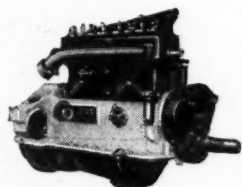
Look first, then, for the Red Seal on the motor in the car or truck you buy, and be sure of motor satisfaction.

CONTINENTAL MOTORS CORPORATION

Offices:
Detroit, Michigan

Factories:
Detroit-Muskegon

Largest Exclusive Motor Manufacturers in the World



America's Standard Truck Motor. Look for the Red Seal Nameplate.

Continental Motors

STANDARD POWER FOR AUTOMOBILES, TRUCKS AND TRACTORS



KOEHLER

REG. TRADE MARK

Trucks and Road Tractors

A New Improved Line Built to High Standards of Quality

The Koehler truck and road tractor line is relatively old in name, but new in all essential details—new in its mechanical assurances of ruggedness, power, economy and durability, new in convenience and all-around serviceability; new also in the sales advantages it offers to dealers.

It is not a revamped line, changed here and there to provide talking points. It is a new line built to meet new and broader trucking responsibilities. Its quality goes consistently through all phases of construction, from motor to minutest details of chassis.

It is the up-to-the-minute Koehler solution of the problem developed by present-day truck transportation—greater-than-ever power, reliability and flexibility **WITHOUT THE SACRIFICE OF ECONOMY.**

The salability of this new Koehler line will be evident to dealer and prospective owner on first inspection. The Koehlers look as well as act their great capability. They inspire immediate confidence—and this confidence is backed up by the fact that all features of the new Koehler line have demonstrated their worthiness under protracted tests three times as severe as any that will ever be given them in regular service.

Business people MUST have good trucks—more and more of them. Get your share of these profitable sales with the Koehler—which sells readily, stays sold and brings repeat orders.

Write today for complete literature and our unusually liberal dealer proposition.

H. J. KOEHLER MOTORS CORPORATION
151 Ogden Street Newark, N. J.

The KOEHLER Line

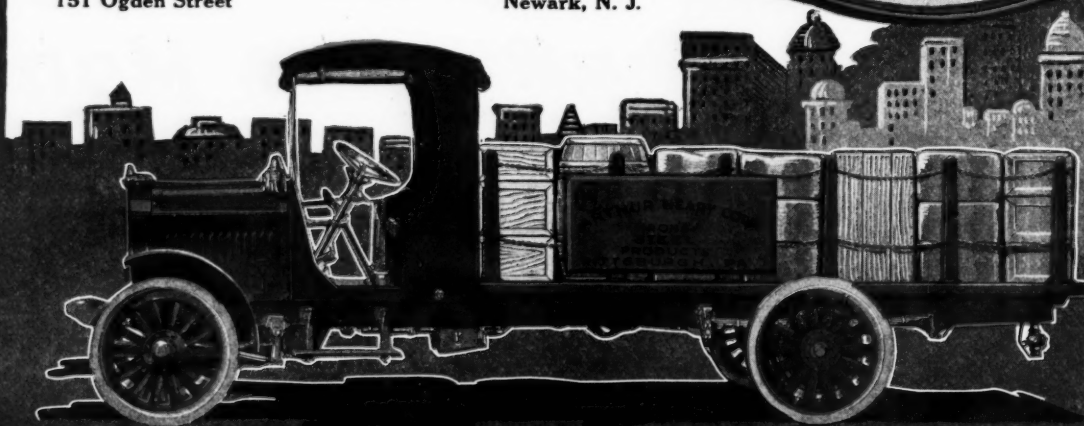
Model "K," 1¼-ton truck chassis \$1450
Model "M," 2¼-ton truck chassis \$2965
Model "KT," 3-ton road tractor chassis\$1535
Model "MT," 5-ton road tractor chassis\$3050

Some of the Koehler Model "M" Points of Merit

Koehler-Hercules 5-bearing crankshaft motor with Tungsten steel valves; Fahrig metal and Non-Gran bronze bearings; positive pressure oiling; Lavine steering; Brown-Lipe transmission and clutch; Timken-Detroit worm-drive rear axle; built-up, heavily-armored radiator; Chrome Vanadium springs, heat-treated and tempered; propeller shaft supported at center universal joint in SKF self-aligning, annular ball bearings.

A score of other features equally indicative of high quality and reliability. Learn about them.

The KOEHLER Line is the "line of least resistance"



Raybestos



MOLDED CLUTCH FACING

GREATEST STEP
FORWARD SINCE THE
INCEPTION OF
THE DISC CLUTCH

Patented
&
Guaranteed

IN the production of this new facing, we have practically revolutionized efficiency of the disc clutch. Old-fashioned woven facing is now relegated to the scrap-heap. Who can be content with obsolete practice when they can have Raybestos MOLDED Clutch Facing? The instantaneous response of engineering shows how urgently Raybestos MOLDED Clutch Facing was needed and how splendidly it fulfills all requirements.

THE RAYBESTOS
COMPANY

Bridgeport

Conn.

Visible Spark
in Top of Plug
Intensified Spark
in Firing Chamber



Meet Mr. VIZ-SPARK

Viz-Spark is a standard spark plug with two big improvements—visibility and intensified spark. Without these improvements it will perform the service of any high class spark plug; with these improvements it will do more than any other spark plug—because it will indicate the condition of your ignition at a glance, while the intensified spark practically will prevent fouling, and insure increased power.

WHAT VIZ-SPARK DOES:

The intensified firing spark insures complete combustion;—
Complete combustion reduces carbon deposit to a minimum—
Complete combustion eliminates the fouling of plugs—
Complete combustion prevents sticking of valves—
Complete combustion eliminates necessity for frequent valve grinding—
Complete combustion makes possible a lean gasoline mixture—
Complete combustion insures gasoline economy—
Complete combustion insures maximum power under all conditions.
Intense firing spark makes cold weather starting easy.

Price \$1.50

Mail orders
filled where
dealers cannot
supply you.

WHAT VIZ-SPARK SHOWS:

A visible spark in the top of the plug shows the condition of the ignition and combustion system of the motor. The additional gap in the plug reduces the current taken from the battery to a minimum.

A small, bluish white spark, when uniform on all plugs, indicates uniform compression and ignition on all cylinders.

A large yellowish spark on one or more plugs indicates loss of compression or excess of oil in corresponding cylinder.

A large red spark indicates that the plug is not firing.

No spark indicates an open circuit in the wiring or distributor.

Opportunity for Dealers, Jobbers and Distributors

Wherever introduced Viz-Spark is a fast seller. Its great and many advantages appeal instantly. Write us for special discounts. Some good territory open for experienced men as distributors.

VISIBLE SPARK PLUG CO., 401 McKenna Bldg., Pittsburgh, Pa.

When Writing to Advertisers, Please Mention Motor Age

The HUFFMAN H TRUCK

\$1495

With Internal Gear Drive
\$1695 with Worm
Drive



An Unusual Truck at An Unusual Price

Standing alone, there is nothing unusual about this price of \$1495—but coupled with a truck of 2,000 to 5,500 lbs. carrying capacity, including body weight, it becomes a decidedly unusual price. But then the Huffman is an unusual truck. Every dealer who will take the time to investigate what this truck offers will instantly recognize that.

Take for instance the wide range of power and flexibility, a range that gives plenty of speed for light loads and plenty of power for heavy loads. That forms the foundation of the Huffman merchandising plan. *Write or wire for details.*

GENERAL SPECIFICATIONS

MOTOR—4 cyl. Continental—Red Seal.
IGNITION—Dixie High Tension Magneto.
CARBURETOR—Zenith.
CLUTCH—Fuller—Dry Disc Type.
TRANSMISSION—Fuller—Unit Power Plant Type.
STEERING GEAR—Lavine Irreversible.
FRAME—Hydraulic Pressed Steel Channel.
FRONT AXLE—Drop Forging with Timken Bearings.

REAR AXLE—Torbensen Internal Gear or Standard Worm Drive.
SPRINGS—Perfection—Special Design.
TIRES—Firestone.
WHEELBASE—140 inches.
LOADING SPACE—10½ ft. from rear of seat to end of frame.
CHASSIS WEIGHT—3200 lbs.

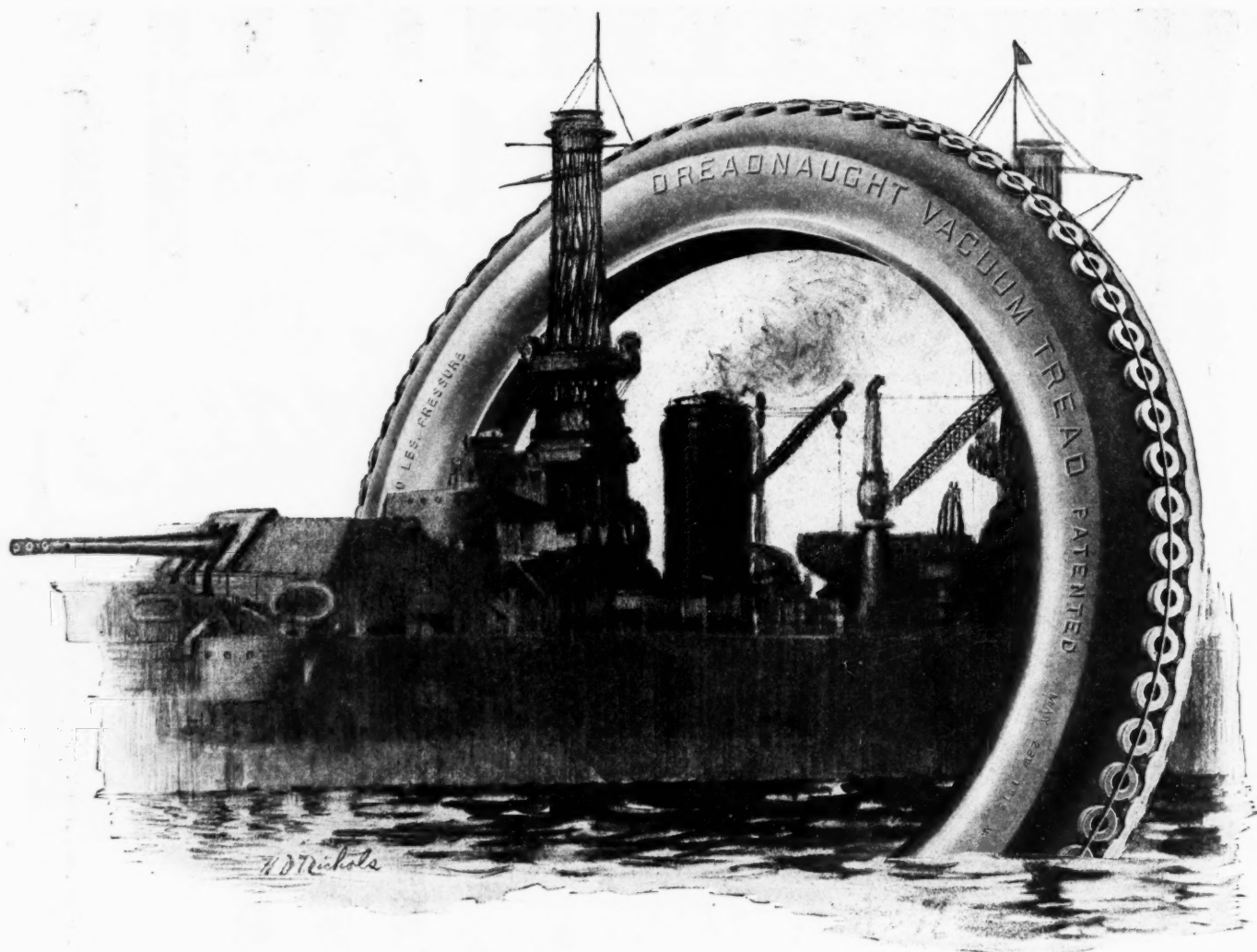
If you are a truck dealer or would like to be a truck dealer, send for complete details.

HUFFMAN BROTHERS MOTOR COMPANY

MAIN OFFICE AND FACTORY,

ELKHART, INDIANA

BRANCH AND SHOWROOM—2425 MICHIGAN AVE., CHICAGO, ILL.



DREADNAUGHT TIRES

STAMINA—That is the word—stamina, the inbuilt capacity to endure. It is this enviable quality which empowers DREADNAUGHT TIRES to yield mileage in excess of the popular guarantee.

6000 MILES GUARANTEED

Manufactured by
THE DREADNAUGHT TIRE & RUBBER CO.
BALTIMORE, MARYLAND

DEALERS who consider that they are entitled to share in the benefits of selling DREADNAUGHT TIRES are invited to wire or write for terms.

CHARLES F. U. KELLY, Inc., Sales Department, 1834 B'way, New York

"Look for the Red Tag"

CAUTION

This tag is attached to all genuine Stewart Repair Parts.

LOOK FOR IT!

If you don't find this tag, you are getting imitation substitute parts. Refuse to accept them.

The use of imitation parts on any Stewart Product, at our option, invalidates the Stewart guarantee.

For your own protection demand genuine Stewart Parts.

STEWART-WARNER SPEEDOMETER CORPORATION

This red tag identifies genuine Stewart parts. For your protection as well as your customer's. Demand it on the parts you buy.

Advertisement
Number Six
of a Series

"You Have Never Thought of This Angle of It"

If you are selling imitation parts in any quantity, it is only because your customers don't know it. If you **dared** tell them they would not buy.

When you buy things for your own personal needs, you don't accept imitations **knowingly**, do you? Why not give your own customers the same **fair** deal you expect from others?

You have never thought of this angle. That's why you have probably stocked up with imitations. Clean house at once. The **genuine** are the best and safest to handle.

Therefore, sell only
GENUINE Stewart
Replacement Parts

Stewart-Warner Speedometer Corp.
Chicago, U. S. A.

"Hang up this Sign"

We Sell Only
AUTHORIZED

Stewart

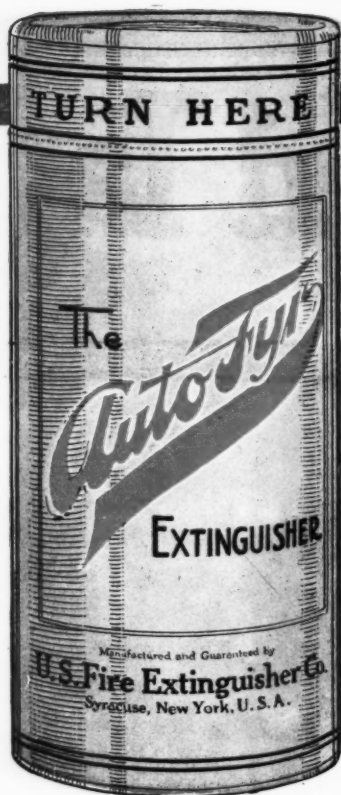
REPAIR PARTS

LOOK FOR
THIS
RED TAG



ATTACHED TO
ALL GENUINE
Stewart PARTS

This sign is **FREE**.
Lithographed and
embossed on metal
14 x 20 in. Very
effective. Send
for it!



Guarantee

Warranted to put out Fire as effectively as extinguishers selling at 5 times the price.

Dealers throughout the United States are waking up to the bigness of this proposition. They know that thousands of Auto Fyr Extinguishers are going to be sold in their localities in the next few months. They want to do the selling. You want your share. Write or wire us at once for proposition. Exclusive territory.

THE

Auto Fyr

EXTINGUISHER

\$2.50 POSTPAID

Positive Protection—Minimum Cost

When Writing to Advertisers. Please Mention Motor Age

Five times the price won't buy a better extinguisher

Auto Fyr makes it possible for every motorist to get the most reliable and convenient fire protection on the market at a ridiculously low figure.

Auto Fyr sells for only \$2.50 and is **guaranteed** to smother any fire as quickly and effectively as extinguishers selling at five times the price.

There is nothing mechanical about Auto Fyr—nothing to get out of order. Nothing to invite confusion.

Auto Fyr consists of a generous sized, strong, water-proof and water-tight box filled with a harmless, dry chemical compound. **This compound will not cake nor will it deteriorate with age.** It is always ready for use.

It is quick and effective. A handful thrown at the base of a fire, turns instantly to a gas which displaces the air, immediately checking combustion.

The gas from Auto Fyr will penetrate to otherwise inaccessible places—reaching the source of the blaze.

Auto Fyr will not corrode the metals or damage the finish of your car. It contains no grit.

Wherever gasoline and oil are used Auto Fyr is indispensable.

U. S. Fire Extinguisher Co.
Syracuse, N. Y. U. S. A.



The Fire Is Out in a Minute

Snatch the AUTO FYR box from under the seat. Open it with a quick twist of the wrist. Throw a handful at the base of the flame—throw it hard. Hold the rest in reserve. Nine times out of ten a handful does the business. The fire is out.

Fits in the Tool Box Under the Seat



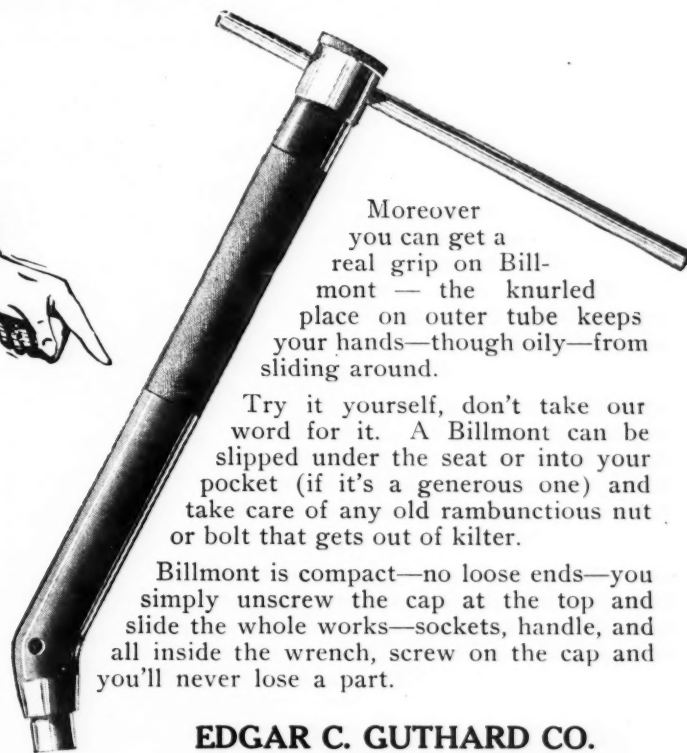
Size, 7 $\frac{3}{4}$ inches high by 3 $\frac{3}{8}$ inches in diameter; weight, 2 $\frac{1}{2}$ pounds.

"Put Your Tool Kit in Your Pocket"



No need to carry a whole machine shop when you go motoring, or if you are a man who repairs cars, don't carry a "basketful" of "jim-racks," none of which ever seem to be just the one you need.

Do it the Billmont way! Have at instant command of your fingers a wrench that does all the "fixin" the car will ever need and more. A wrench that will poke its hooked nose into any old spot or hard-to-get-at nut or bolt and spin it off with vengeance. No "skidding" off the nut either, because Billmont sticks; no knuckle-skinning, because Billmont keeps your hands away from tight places; no tedious taking off and refitting to the nut to make a complete turn, because Billmont's shuttle-like handle slides back and forth and you make the full turn on any nut. Even the fourth connecting rod nut on a Ford is no task for Billmont.



Moreover you can get a real grip on Billmont — the knurled place on outer tube keeps your hands—though oily—from sliding around.

Try it yourself, don't take our word for it. A Billmont can be slipped under the seat or into your pocket (if it's a generous one) and take care of any old rambunctious nut or bolt that gets out of kilter.

Billmont is compact—no loose ends—you simply unscrew the cap at the top and slide the whole works—sockets, handle, and all inside the wrench, screw on the cap and you'll never lose a part.

Get a Billmont from your dealer or should he be unable to supply you let us know—we'll tell you where they are to be had.

The complete set—master wrench, 4 sized nut sockets, 1 screw driver, and 1 adapter that will allow you to use any size socket you may have retails for \$10.00 (in a compact wooden case).

Dealers—Write your jobber or us for discounts.



Branches—341 Phelan Bldg., San Francisco, Cal.; 230 Rialto Bldg., Kansas City, Mo.; 207 W. 76th St., New York; 628 Plymouth Bldg., Minneapolis, Minn.

EDGAR C. GUTHARD CO.
361 E. OHIO ST., CHICAGO

BILLMONT MASTER WRENCH

"The Wrench that Spins'em off"

When Writing to Advertisers, Please Mention Motor Age

It pays to sell AC Spark Plugs, for the public has been convinced that it pays to use them.

Those dealers, who concentrate on the AC line, enjoy these advantages, all essential to successful merchandising:

They are identified with an established and progressive company, founded in 1908 and continually developing its product through the succeeding successful years.

They are selling spark plugs that have long been the standard equipment on most high grade makes of passenger cars and motor trucks.

These plugs are of the same basic design as the AC aviation plugs that were adopted as original equipment on all Liberty and Hispano-Suiza airplane motors.

The demand for AC Plugs is tremendous and growing daily, due largely to the efficient and dependable service that AC's are giving in millions of motors.

Dealer sales are being constantly stimulated by an aggressive advertising campaign, running in all the leading magazines throughout the country.

AC Spark Plugs are fast and sure sellers. They are a source of profit, satisfaction and good will. Turnovers are frequent and repeat sales the rule.

Stock the complete AC line. The sooner you do, the better for your spark plug business. Complete dealer information on request.

Champion Ignition Company, FLINT, *Michigan*

U. S. Pat. No. 1,135,727, April 13, 1915, U. S. Pat. No. 1,216,139, Feb. 13, 1917, Other Patents Pending

*The Standard Spark
Plug of the World*



These manufacturers use AC Spark Plugs for factory equipment

Acason Trucks	Chevrolet	G. M. C. Trucks	K-Z Trucks	Nelson Tractors	Reo	Sterling Motors
Acme Trucks	Chicago Trucks	Gramm-Bernstein	La Crosse Tractors	Nelson & Le Moon	Re Vere	Sterling Trucks
Advance-Rumely	Cole	Trucks	Lalley-Light	Trucks	Riker Trucks	Stewart Trucks
Tractors	Commonwealth	Gray Dort	Liberty	Netco Trucks	Robinson Fire	Straubel Engines
Ahrens Fox Fire	Conestoga Trucks	Hackett	Liberty Aircraft	Northway	Trucks	Sullivan Trucks
Trucks	Continental Motors	Hall Trucks	Motors	Oakland	Rock Falls	Swartz Lighting
American-La France	Crane-Simplex	Harvey Trucks	Locomobile	Old Reliable Trucks	Rowe Trucks	Plants
American Trucks	Daniels	Hatfield	Maccar Trucks	Oldsmobile	Rutenber Motors	S-S-E-Co.
Anderson	Davis	Haynes	Marmon	Owens Light &	Samson Tractors	Titan Trucks
Apperson	Deere Tractors	Herschell-Spillman	Master Trucks	Power Plants	Sandow Trucks	Tower Trucks
Appleton Tractors	Delco-Light	Hispano-Suiza	Maxim Fire Trucks	Packard	Saxon	Universal Trucks
Auburn	Diamond T Trucks	Howell Tractors	Maytag	Paige	Scripps-Booth	United States Motor
Avery Tractors	Diehl Trucks	Hudson	McLaughlin	Pan-American	Scripps Motors	Trucks
Beck-Hawkeye Trucks	Dodge Brothers	Hupmobile	(Canada)	Parker Trucks	Seagrave Fire Trucks	United Trucks
Betz Trucks	Dort	Jackson	Menominee Trucks	Paterson	Seneca	Vim Trucks
Brockway Trucks	Duesenberg Motors	Jordan	Midland Trucks	Patriot Trucks	Signal Trucks	Ward La France
Buffalo Motors	Eagle Tractors	Jumbo Trucks	Mitchell	Peelless	Singer	Trucks
Bugatti	Essex	Kalamazoo Trucks	Moline-Knight	Phianna	Smith Motor Wheel	Westcott
Buick	Federal Trucks	Kent Concrete Mixers	Moreland Trucks	Pierce-Arrow	Standard "8"	White
Cadillac	F-W-D Trucks	Kissel Kar	Napoleon Trucks	Pilot	Standard Trucks	Whitney Tractors
J. I. Case T. M. Co.	Gabriel Trucks	Kleiber Trucks	Nash	Pioneer Tractors	Stearns-Knight	Wilcox Trux
Chalmers	Genco Light	Klemm Trucks	National	Premier	Stearns Tractors	Wisconsin Motors
Chandler	G. B. S. Motors	Knox Tractors	Nelson	Ranger Trucks	Sterling Engines	Wolverine Tractors

NEARLY TWO
MILLION DOLLARS WORTH OF WHEAT
WAS HARVESTED IN THIS COUNTY
THIS SUMMER

OVER 50 COAL MINES
IN SULLIVAN COUNTY
PRODUCE ABOUT
10,000,000 TONS
YEARLY

THE COUNTY
HAS ALSO MANY PRODUCING
OIL WELLS & A SEEMINGLY
INEXHAUSTIBLE SUPPLY OF
NATURAL GAS

SULLIVAN
HOME OF THE
"MUTUAL"

back of
MUTUAL

SULLIVAN
COUNTY
INDIANA

THE LARGEST SILO IN THE WORLD
IS IN SULLIVAN COUNTY — A
COUNTY FAMOUS FOR ITS PRIZE
WINNING LIVE STOCK

NO exclusive truck company, that we know of, started its business life under such favorable auspices as ours.

A wealthy, but conservative, community was won over to the big idea of backing this new industry, not by any dazzling promotion methods, but by the quiet earnestness of a fellow-citizen who knew he was right, and who kept patiently telling his story for more than two years.

Bankers, farmers, stockraisers, merchants, lawyers, local coal mine and oil well owners—solid citizens of the county, finally became convinced that the way to make their community an industrial center was to build something better than it had ever built before; and to offer it at a price that would give the buyer more for his money than he could get anywhere else.

The idea of building "America's Greatest Truck" appealed to them as the surest way of making Sullivan the home of America's greatest truck Company—and with that enterprise other industries, in the same or other fields.

So, the Mutual Truck Company starts into business with ample working capital; with a new plant fully paid for; with a motor truck which IS "America's Greatest Truck" and with as many millions of local capital back of it as are necessary to build any number of Mutual Trucks and to carry out national, vocational and local advertising campaigns, which will so win and hold the attention of prospective truck buyers, that "Mutual" dealers will soon be in command of the high-class heavy-tonnage truck business of their localities.



A Whole Rich County

its Only Industry:

MUTUAL

"AMERICA'S GREATEST TRUCK"

Built wholly from units and parts that have proved themselves to be *the Masterpieces* of the truck industry.

Specifications 2-Ton Mutual Price—Chassis—\$3,375.00

Engine—Wisconsin UAU four-cylinder 4¼ x 6, SAE Rating, on bore only, 29 h. p. Actual power, calculating both bore and stroke, 39 h. p. at 1000 rpm. Most other high priced 2-ton trucks use 4 x 5½ motors rated at 25.6 h. p. Wisconsin was selected, because an exhaustive study of all makes convinced us that it was "America's Greatest Truck Motor".

Clutch—Hele-Shaw—Universal No. 5 with Multiple grooved plates running in oil. Remarkable for its smooth, regular pick-up and firm final grip; its ease of operation and wear-defying long life. Costs us two to three times as much as clutches used on most other high priced 2-ton trucks.

Universal—Spicer—Highest priced and universally acknowledged to be the best. Three joints in the shaft and one in the Universal clutch.

Transmission—Fuller, Model G-5, mounted amidships; 4 speed forward and reverse. How many other trucks offer four speeds?

Frame—Parish & Bingham Pressed Steel—6½ in. channel, with 3 in. flange, pressed from ¼ in. alloy steel. We could build our own from structural steel at half the cost.

Springs—Mather Chrome Vanadium Steel. Best and cost most.

Radiator—Perfex—Cast type, three-point suspension, of our design.

Steering Gear—Ross—with 20 in. wheel. The costliest and most highly perfected type of the most famous maker.

Magneto—Bosch, ZR4, waterproof, and dustproof; with impulse starter.

Carburetor—Stromberg "M"—Latest type.

Cab—Weather-tite, whose equal no other truck maker will furnish for less than \$175 extra—is a part of our regular equipment.

Castings—Electric steel at vital points where others use malleables.

Governor—Duplex (not Simplex) type, controlling both engine speed and road speed independently from each other.

TERRITORY now being assigned

We shall be as critical in selecting our district and local sales representatives as we were in choosing the parts that make the Mutual "America's Greatest Truck".

But when we do make a man our agent, we back him to the limit with both local and national advertising.

In applying for territory, give bank references, population of territory asked for, and estimate of the number of high class 2-ton, 3½-ton and 5-ton trucks you expect to sell in a year.

MUTUAL TRUCK COMPANY

Rear Axle—Worm drive 2½ ton size, ball bearing. Highest priced axle put on a 2-ton truck.

Front Axle—Sheldon, ball bearing steering knuckle type.

Wheels—Smith Metal Wheels, for solid tires and Dayton Steel Wheels for pneumatic tires; furnished as regular equipment, tho they cost us 55% more than the best wood wheels.

Tires—Firestone or Goodyear. 36 x 4 front and 36 x 8 rear, solid tires. Pneumatic tires are furnished at a reasonable extra charge.

Bushings—Bound Brook Oilless, thruout. Eliminating oil and grease cups, and insuring constant lubrication.

Gas Tank—25-gallon capacity.

Reserve Lubricating Oil Tank—2½-gallon with indicator and feed valve on dash. No other truck has this important feature.

Some high class trucks have SOME of the above super-specifications; but no other truck in America offers all of them, or corresponding parts of equal merit or equal cost at ANY price. The cab, electric lights, steel wheels, lubricating oil tank, Bound Brook bushings, electric steel castings and other features of our regular equipment, if added to the "cheapest" truck would raise its price far above that of the Mutual. The Mutual gives more for the money than any other truck. Figure it out for yourself.

MUTUAL TRUCK COMPANY, SULLIVAN, INDIANA



Makers of SRB Annular
Ball Bearings, Taper Roller
Bearings, Steel Balls and
Ridge-Whitworth Wire
Wheels.



***Standard Bearings will withstand
greater overloading***

The design allows for more balls than any other bearing, making possible a smoother and more even distribution of the load.

This standard principle of load distribution, backed by exacting selection of materials, and by scrupulous accuracy of workmanship, has produced a bearing of much greater strength and longer life.

**STANDARD ROLLER BEARING CO.
PHILADELPHIA, U. S. A.**

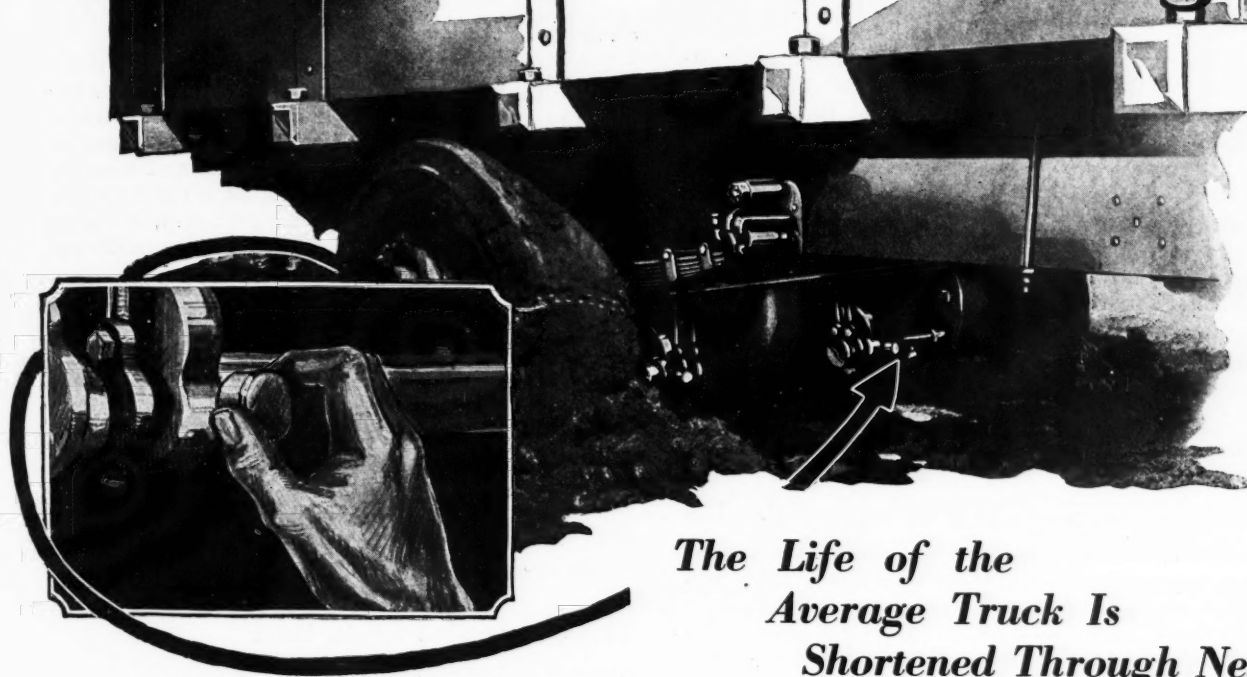
SALES OFFICES:

Detroit, 936 Woodward Ave.
Chicago, 2206 S. Michigan Ave.
San Francisco, 41 Spear St.

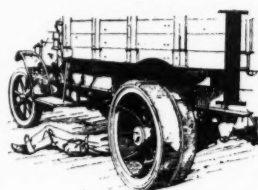
Indianapolis, 646 N. Meridian St.
New York, 1737 Broadway

Boston, 84 Brookline Ave.
Cleveland, 2062 Euclid Ave.
St. Louis, 3126 Locust St.

Every Motor Truck Needs Oil-less Bushings



The Life of the Average Truck Is Shortened Through Neglect



It is a fact that the average truck seldom gives its owner the full period of service that its makers built into it.

For neglected lubrication cuts into the life of the chassis assembly, causing premature wear and breakdown.

The ordinary day's work of a truck driver is a hard enough grind in itself without adding to it the hours of irksome labor required to remove, fill and replace 25 or 30 inaccessible grease cups.

Thus neglect is its usual portion, with all its evil consequences.

All Genuine Graphited Oil-less Bushings have always been made at Bound Brook, U. S. A.

BOUND BROOK OIL-LESS BEARING COMPANY

Specialists in the manufacture of Oil-less Bushings for more than a third of a century.

Bound Brook

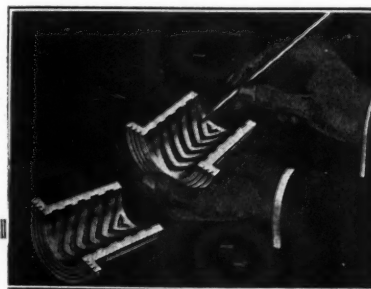
Detroit Office: 1723 Ford Bldg.

New Jersey

Bound Brook (graphite and bronze) and Nigrum (impregnated wood) Oil-less Bushings have been designed to free chassis lubrication from its dependence on human agency.

There is no danger of quick wear, either from neglect or corrosive action, at bearing points equipped with Oil-less Bushings. The lubricant in these bushings is self contained and will continue to give service in spite of neglect. Used and endorsed by the leading manufacturers of passenger cars, trucks and tractors.

A Bound Brook Bushing is made of high grade phosphor-bronze just like any other good bushing. But on the bearing surface of a Bound Brook Bushing we case symmetrical grooves or trenches and pack them solid, under hydraulic pressure, with a special fine hard lubricating graphite.



What's happening in the Brake Lining Market?

Things are happening, fast.

And although the cause may be found in the speeding up of the passenger car market, there is an effect that is going to be of interest to the motor truck business.

A new kind of market

With the war over, Liberty Bonds and taxes paid or provided for, and two years of self-denial to spur desire, is it any wonder that the automobile market is a seller's market?

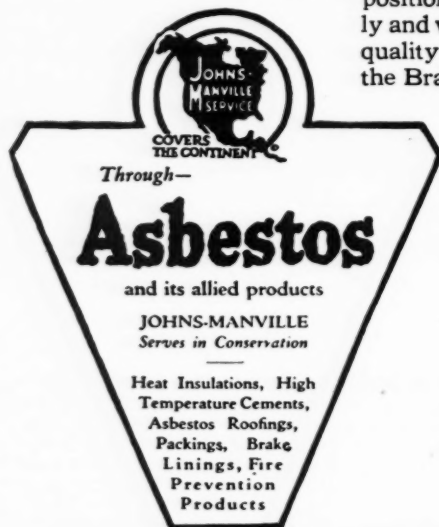
And because there aren't enough new cars for quick delivery to go around, used cars are in greater demand than ever before.

Which means overhauling and repairs and the biggest season for Brake-Lining that we have ever known.

Of great importance to every dealer

In view of this unusual demand and of the conditions prevailing in the asbestos fibre market, you should be absolutely sure that you are tied up to a dependable source of supply, to insure your being able to handle the greater Brake-Lining business that is fast on the way.

And that is why it is important for you to know that, whether or not other manufacturers are going to be embarrassed by market conditions or manufacturing facilities, Johns-Manville, as the largest miners and manufacturers of asbestos, are in a position to meet promptly and without sacrifice of quality every demand of the Brake-Lining market.



Send for literature and get an idea of the facilities and service we place squarely back of every NON-BURN dealer. It's something you'll find worth bearing in mind.

H. W. JOHNS-MANVILLE CO. New York City 10 Factories—Branches in 63 Large Cities

Other Johns-Manville Automotive Equipment — Clutch Facings, Industrial Brake Blocks, Speedometers, Odometers, Recorders, Speedometers with Instrument Board for Ford Cars, Fire Extinguishers.

JOHNS-MANVILLE AUTOMOTIVE EQUIPMENT

When Writing to Advertisers, Please Mention Motor Age

A little bit of history

Some years ago, we promised ourselves three things, just in the way of sound business insurance; first, to maintain the high quality of our Brake-Lining, at whatever cost; second, to make secure our sources of supply of raw material and steadily develop our mines and factories, as an investment against a day of maximum demand; and, third, to hold fast to a policy of square dealing with our trade, for their protection and our own.

A little bit of prediction

We kept those promises, and today this policy is bearing fruit as never before. In other words, we are not only willing, but able, to stand back of our dealers all along the line, and it's the kind of support that dealers would gladly pay premiums for later on. Our dealers won't have to do this, nor will they have to worry about where their Brake-Lining stocks are coming from.

These are the facts that make it possible

Johns-Manville Non-Burn is the only Brake-Lining for which the supply of asbestos fibre is controlled by the manufacturer from mine to market. Moreover, with two of the largest asbestos mines in the world to draw on, we can be positive that only the finest long-fibre quality goes into Non-Burn, and with two big manufacturing plants, one in the East and the other in the West, we can assure a steady supply and prompt deliveries.

ARE YOU GUESSING At FORD Electrical Repairs?

The new model Ford has, as standard equipment, an electric starting and lighting system.

Do you know the principle or the details of this equipment?

Can you locate trouble and then repair it, without help—or do you waste a lot of time guessing?

If a customer drove in today and said his starter didn't work—WHAT would you do?

If you do not know the F. A. Electric Starting and Lighting System on Fords you should post yourself—immediately.

The best way to avoid trouble is to be prepared. And the only way you can learn all about this new system, without going to the factory for instruction is to study this book.

The FORD STANDARD ELECTRICAL EQUIPMENT

Starting Lighting Ignition

This book, prepared by experts for the every day man, describes first the construction of the F. A. System. It tells of every wire—every screw—every connection and what it is for. It is full of photos—more detail photos than ever before put in a book—and accurate diagrams. With it you can take any Ford installation and tell instantly what any wire or connection is for. It traces every circuit complete.

Another section deals with the theory of the action of the F. A. system: How the motor, generator and battery works. All the mysteries of electricity, for the auto simply told.

Then the most important section of all—the one that tells every form of possible trouble and how to locate it—and having located the trouble—how to fix it.

ARE YOU READY FOR THE TEST?

Could you take care of your customer—give him the service he wants—the service to which he is entitled. Or would he have to go to some other shop for his electrical repairs—and so eventually all his repairs? Are you ready to have your customer drive in and say that his battery doesn't charge—or his starter don't work?

Even if you could "tinker" him up, isn't it far better to know ALL about his electrical equipment.

This book—110 pages—47 illustrations and diagrams, bound in leather, sells for only \$2.50. Send \$2.50 in an envelope with the coupon. Look the book over for 3 days—if it is not, in your opinion, the best investment you ever made for your shop—send it back and we return your \$2.50.

Mail the coupon now and let this book help you in your Ford work.

Order through your jobber or direct from the publishers.

American Bureau of Engineering

Makers of the famous AMBU Electric Trouble Shooter

1605 S. Michigan Ave., CHICAGO

If it has



It is right

Enclosed find \$2.50 for which send me your book, "The Ford Standard Electrical Equipment." If it isn't the book I want I will return it in 3 days and you will return my money.

Name

Address



The Hose Fastener of the Pump That Oils Itself

A small but useful part of this pump of many features. This fastener is designed to keep the hose from injury when in the tool box. It turns in any direction. Fastening or unfastening is but a matter of seconds.

This fastener will be appreciated by your trade. It is one of the many points that have made the Whirlwind Pump the most "called for" single pump on the market.

COE-STAPLEY

Whirlwind Tire Pump

Will sell to every car owner who has had experience with the back-breaking, leaky, "short winded" pump. The Whirlwind Pump hasn't a single weak point, and it *has* features that make it dominant in ease and quickness of operation and long life.

DEALERS—Stock up on this high duty service pump. It sells on demonstration, over every other pump, regardless of price. It is the biggest \$3.50 worth that ever went over your counter. *Your profits will pay you well.*

COE-STAPLEY MANUFACTURING CORP.

Factories, Bridgeport, Conn.

Executive Offices, 136 Liberty Street, New York

FEATURES THAT COUNT

Self Lubricating—A grease reservoir keeps the bucket lubricated. It is always soft, pliable and leak-proof.

Positive Acting Ball Stop Valve.

Extra Strong Plunger Rod to which the bucket and lubricating reservoir are attached.

Heavy Base—making the pump well able to "stand on its own feet." The foot space (for both feet) is ample.

Handle is Extra Heavy Nickel Mounted.

Oversized Barrel—Finished in Gray Baked Enamel.

BEST QUALITY Rubber Hose.

DEALERS

If your Jobber, perchance, cannot give you the details we will furnish them.

The Standley Adjustable Luggage Carrier

Who wants to make a trip up to the lakes, or anywhere else, with a lot of excess luggage dangling all over the fenders, running boards and rear springs?

Nobody does—or will—if he can get a STANDLEY ADJUSTABLE LUGGAGE CARRIER from under the seat, unfold it and adjust it to the proper size to contain all excess luggage.

There are hundreds of motorists—many of them your own customers—who will buy a STANDLEY on sight.

The STANDLEY fits any car, is quickly detached, forms a complete basket and needs no permanent attachments. Clamps are provided with lock nuts which protect them from working loose.

Adjustable to any length from 10 to 44 inches.

Dealers—Order from your jobber. If he can't supply you, write us direct. Retail price \$5.00

STANDLEY SKID CHAIN CO.

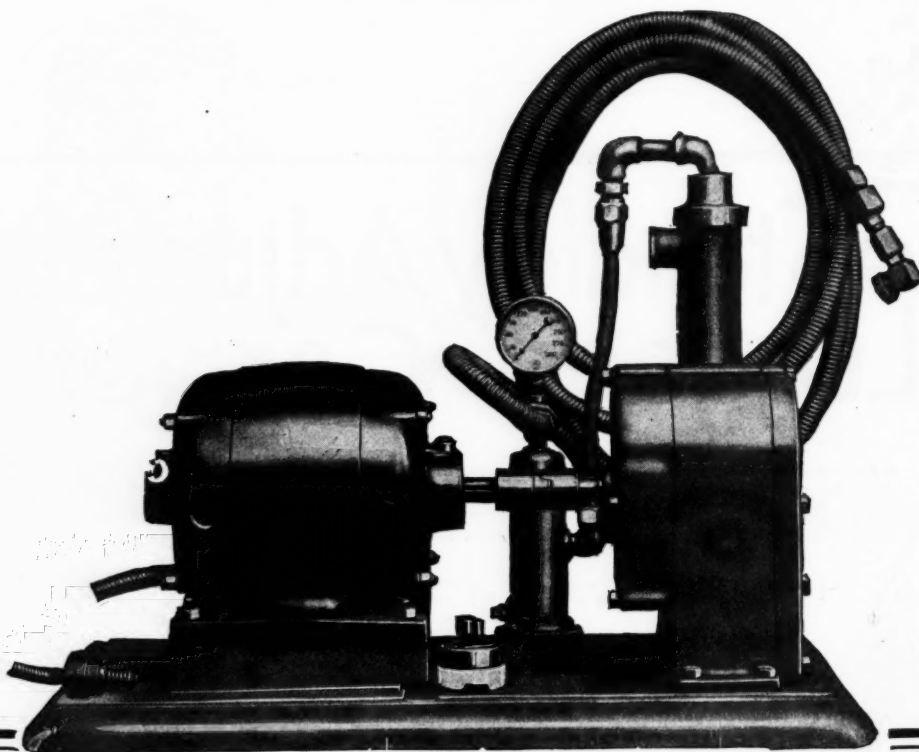
BOONE, IA.

Eastern Branch:
334 Second Ave., Pittsburgh, Pa.

\$5
Fits any
Car



When Writing to Advertisers, Please Mention Motor Age



**Every Garageman Who Believes in Real Service and
Efficiency Should See the Compressor That
Pumps Tires in Half the Time**

Then He Will Know the Trade-Winning Advantage of Serving Customers Twice as Quickly

Note: It costs the same
as other compressors

This new no-cylinder-head-clearance compressor was named for its exclusive quick-action feature—the long six-inch stroke that carries the piston flush with the top of the cylinder.

Hence, with every stroke—*twice as much air in the tire.*

The following things that you can do with a LONG STROKE Compressor are actual *performance figures*, not somebody's theories about air displacements. You will pump a 30 x 3 tire from dead flat to 60 pounds in 28 seconds—a

34 x 4 tire from dead flat to 80 pounds in 90 seconds—a 35 x 5 tire from dead flat to 90 pounds in 145 seconds.

And this double-power, quick-speed service costs you not one fraction of a cent more for current than do the weaker, slower-going pumps. Nor is the purchase price—the first cost—any higher.

So—you can afford one. There are various models to choose from. Send for literature that describes a complete line.

Attractive discounts and territorial rights to jobbers and distributors. Write for particulars.

The MOTOR-COMPRESSOR Co.
Makers of Starting Devices and 2-Stage Compressors
52-60 DICKERSON ST., NEWARK, N. J.

The "LongStroke" Compressor

Templar

The Superfine Small Car



HAT exceptional good taste which achieves at one stroke, both refinement and smartness of style, is expressed in Templar design.

The materials used are selected for efficiency and durability—of that high quality that achieves a low *final* cost rather than a low *first* cost.

Workmanship and finish are executed to contribute without stint to the high quality of a car that ranks with the finest examples of the car builders' art.

Its performance gives one just the thrill and enduring satisfaction expected in driving The Superfine Small Car.

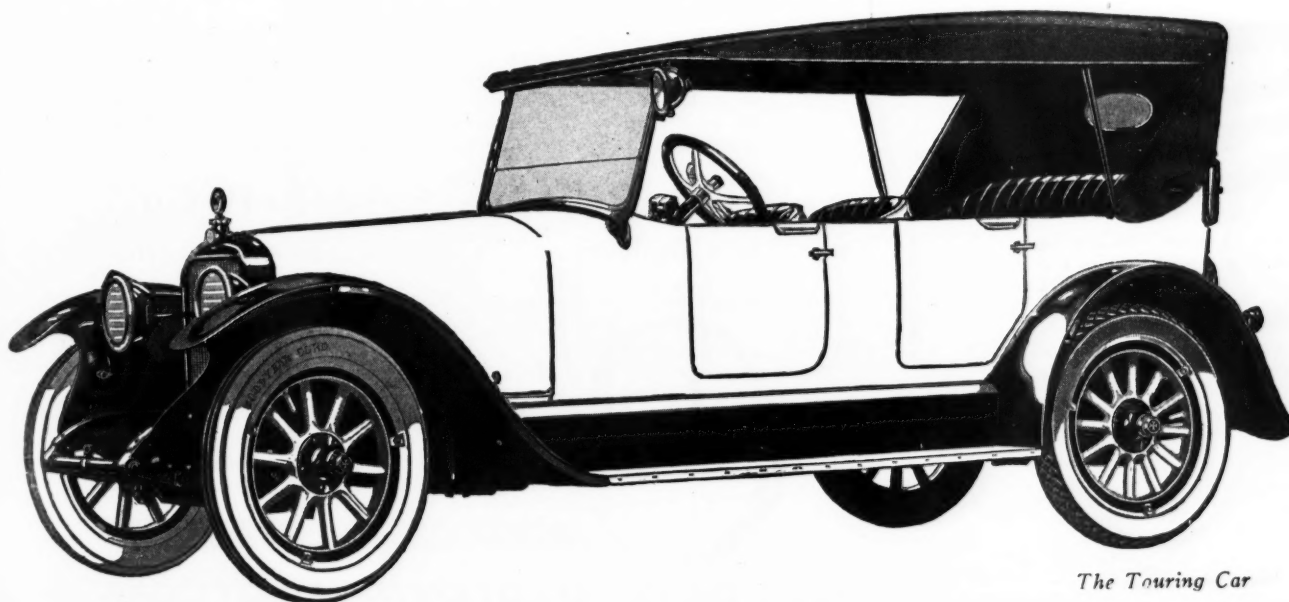
Templar dealers enjoy exclusive advantages in offering the *only* Superfine Small Car.

Templar Top-Valve Motor

Five Passenger Touring \$2485
Four Passenger Sportette \$2485
Two Pass. Touring Roadster \$2485
Five Passenger Sedan \$3285
Prices f. o. b. Cleveland

The Templar Motors Corporation

3100 Halstead Street, Lakewood, Cleveland, Ohio



The Touring Car

*Campbell
Guaranteed
Accessories*



Campbell Tire Covers overcome the big objection to this line of goods. They are easy to put on and are interchangeable with every make of tire. They come in all sizes and styles.



The new Reinforced Latigo Fan Belt is made of special waterproof ducking, scientifically folded and stitched to Latigo leather with rows of heavy thread stitching. Wonderfully durable.



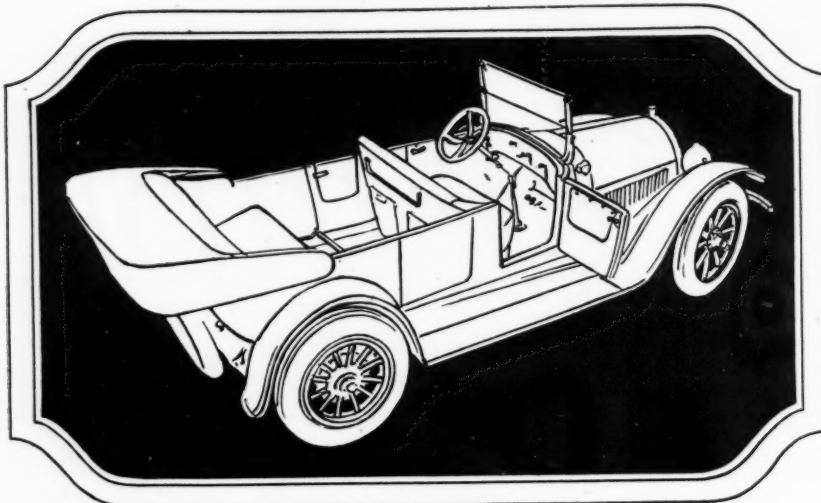
The Campbell Corded Fan Belt for Ford Cars is a really non-stretchable belt. It is made of waterproof canvas interwoven with a series of eight cords and then stitched to leather for pulley facing. Will not stretch or run off.



The Campbell V-Shaped Latigo Belt successfully meets the demand for a belt of this kind. It is made of three plies of heavy Latigo and held together with leather thongs. There is no chance whatever of ripping.



"The Seat Cover de Luxe"



Sell Individuality

One of the strongest of human longings is the desire to be individual, to be different. Men and women too, are constantly searching for something that will set them above the crowd—and win the crowd's approval.

Campbell Detachable Upholstery does this for motor cars and motorists.

You sell individuality when you sell this Seat Cover De Luxe. And because this human yearning for individuality is universal—world-wide—there is no limit to your market.

Here is a line in which there is no possibility for loss. You carry no stock—which means you risk no capital. You sell from a sample book—and we make prompt deliveries.

Furthermore, you acquire the prestige of representing the country's largest makers of seat covers. It is a guarantee to your patron of fabrics rich and elegant; of covers that will wear year in and year out; of a fit—smart, snug and trim; of moderate price, only possible in large scale production.

You and your patrons get all these with Campbell Detachable Upholstery.

Keep abreast of the motoring fashions of the times.

Wire us, write us a letter, or mail us a postcard, and we will give you more interesting information about this line that is already a favorite with 15,000 dealers and jobbers.

The Perkins-Campbell Co.


625 Broadway - - - Cincinnati, Ohio

Campbell

ESTABLISHED 1879

DETACHABLE UPHOLSTERY

When Writing to Advertisers, Please Mention Motor Age



STANDARD AUTO JACKS

TRADE MARK

Our Organization Back of You Helps Sell STANDARD Auto Jacks

It takes an A-No. 1 product first, and a real organization back of it, always, to give a dealer the kind of co-operation necessary to do a big volume of profitable business.

STANDARD AUTO JACKS are backed by extraordinary facilities and an organization which not only preaches co-operation—but puts it into practice.

Dealers representing the STANDARD Line of AUTO JACKS are certain of getting prompt delivery of the most sturdy, durable, reliable auto jacks ever put on the market—a complete line with a jack for every purpose.

We stand back of every STANDARD AUTO JACK you sell. Our intensive selling co-operation will keep your stock moving—and your profits increasing.

Order from your jobber. Write for our Dealer's Co-operative Selling Plan.

**NATIONAL-STANDARD
COMPANY**

8th St. and Howard Ave.

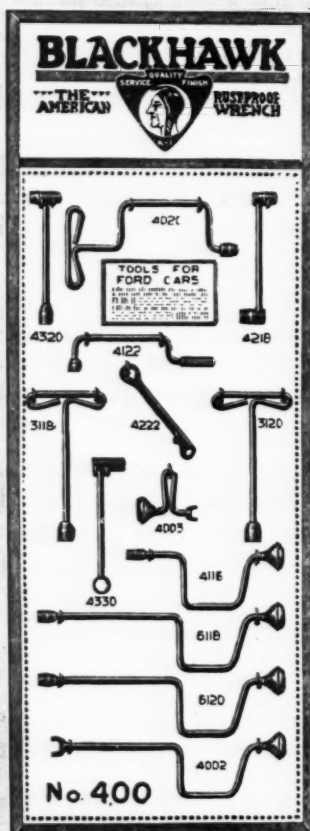
NILES

U. S. A.

MICH.

BLACKHAWK

RUST-PROOF WRENCHES



THE name Blackhawk on a wrench stamps that wrench as an accurate fitting, dependable tool—an appropriate wrench for expert machinist or skilled mechanic.

Sockets are machine turned from the solid steel bar and broached out. Every wrench is finished by the famous Parker rust-proof process.

Individual wrenches, standard combination sets, attractive display boards for dealers.

Every Blackhawk Wrench is guaranteed.

Write for catalog and prices.

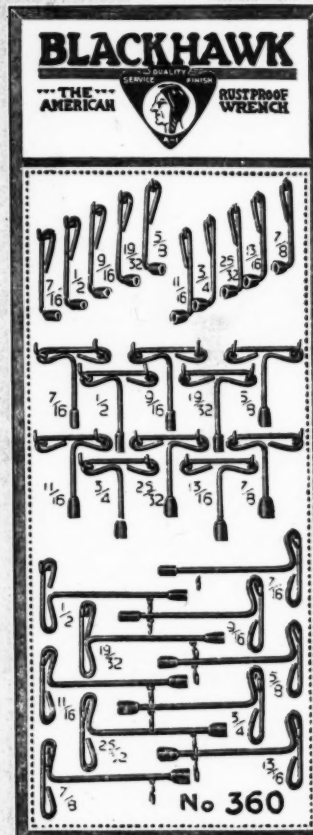
Manufacturers: We make wrenches according to specifications.

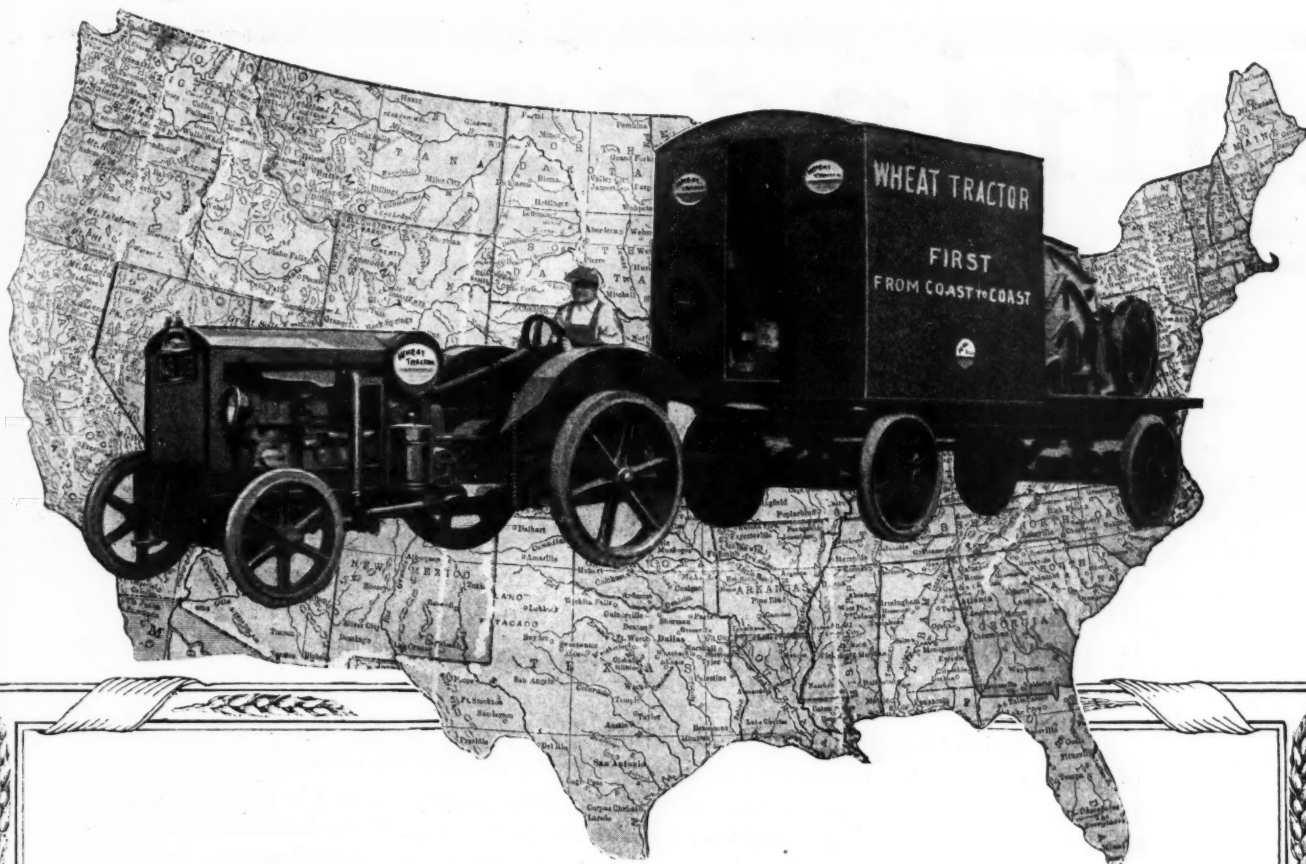
American Grinder Mfg. Co.
Milwaukee, Wis.

Represented by
C. N. & F. W. Jonas

Offices at

Transportation Bldg., CHICAGO
Equitable Bldg., LOS ANGELES
111 New Montgomery St., SAN FRANCISCO
616 Pioneer Bldg., SEATTLE





New York to Wichita— —then on to the Pacific!



Plowed as the official machine at the Wichita demonstration after a 2000-mile trip overland.

THE Wheat Tractor pictured above has completed over half of its trip from coast to coast. Arriving in Wichita on schedule time, this same tractor plowed as the official demonstrating machine.

Changing from the rubber tired road wheels to the heavy cleated field wheels required but a few minutes.

The trip from New York to Wichita, pulling a heavy loaded trailer — plus the actual field demonstration — proves the splendid stamina of the Wheat Tractor.

The road-wheel feature, which made the trip possible, is the greatest single selling feature introduced in the tractor industry.

HESSION TILLER & TRACTOR CORPORATION
BUFFALO, N. Y.



When Writing to Advertisers, Please Mention Motor Age

Infringements

PROTEX GAUGE INFRINGES TWITCHELL
PATENT No. 927,298

REX GAUGE INFRINGES TWITCHELL
PATENT No. 927, 298

PROTEX MANUFACTURING COMPANY,
PROTEX TIRE GAUGE MANUFACTURING COMPANY,
PROTEX TIRE GAUGE COMPANY,
HENRY FRIEDLANDER,
HARRY FRIEDLANDER, and
MAX KUTTNER, Enjoined.

We desire to announce to the trade that by order of the United States District Court for the Northern District of Illinois, Eastern Division, signed December 3, 1918, and by further order of the Court, signed June 17, 1919, the Protex Manufacturing Company, the Protex Tire Gauge Manufacturing Company, and the Protex Tire Gauge Company, and Henry Friedlander, Harry Friedlander and Max Kuttner, the individuals implicated therein, were placed under injunction as to the sale of the so-called Protex Gauge and the so-called Rex Gauge.

This is the last of a long series to date of judicial decisions holding various types of tire pressure gauges to be infringements of patent No. 927,298 issued to Charles R. Twitchell.

As a matter of fact, every tire gauge of the pencil type placed on the market since the issuance of this patent has been held by the courts to infringe the principle and mechanism of the Twitchell Gauge.

In every instance injunctions were applied for and obtained stopping the manufacture and sale of these infringing gauges, and this is a formal notice that the same procedure will be followed in this instance.

We call the attention of the trade to the fact that any person who sells or offers for sale an infringing article is himself liable to a suit for injunction and damages.

We propose to institute suits of this character whenever the occasion presents itself.

By refusing to handle any pencil type gauges other than the Schrader Universal Tire Pressure Gauge and the Twitchell Gauge manufactured by us, jobbers and dealers will avoid rendering themselves liable to such action.

WE ARE DETERMINED TO PROTECT OUR PATENT RIGHTS NOT ALONE AS REGARDS TIRE GAUGES, BUT COVERING TIRE VALVES, DUST CAPS, PUMP CONNECTIONS, AND EVERY OTHER ARTICLE MANUFACTURED BY US.

A. SCHRADER'S SON INC.

783 ATLANTIC AVE.,
LONDON

CHICAGO

BROOKLYN, N. Y.
TORONTO

Gasolater

TRADE MARK

Adds Miles to Every Gallon

The GASOLATER gets more action out of a gasoline engine than was ever thought possible. It is a metallic gasket, bearing a crossbar carrying a Turbine, which is placed between the Carburetor and the Intake Manifold. This Turbine is rapidly whirled by the suction from the Intake; completely shattering the gasoline globules in the mixture before it reaches the combustion chamber. **Result, practically 100 per cent combustion, leaving nothing to form carbon and increasing mileage more than 30 per cent.**

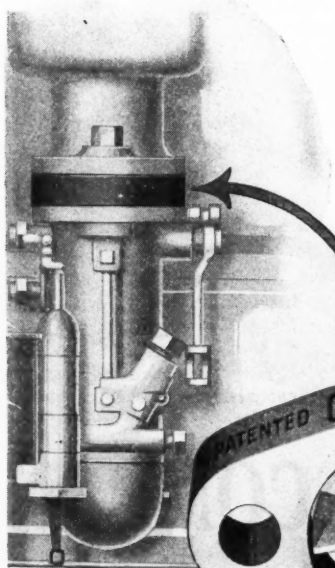
Sold Under Guarantee

The GASOLATER is sold under positive Guarantee of Satisfaction. If Car Owner is not satisfied after 10 days trial that it will do all we claim, we stand behind full refund to him. He is made the judge. Neither he, the Jobber nor the Retailer risks anything.

All the argument in the world is not so convincing as a trial, and our trial offer to the consumer is made with a full knowledge that the Gasolater will perform the service we claim. The GASOLATER is made for all makes of cars.

Here's What It Does

1. Eliminates and prevents carbon.
2. Eliminates, to a large degree, the grinding of valves.
3. Eliminates necessity of cleaning spark plugs.
4. Eliminates carbon from piston rings, thus assuring high compression.
5. Brings combustion in cylinders to highest point.
6. Saves more than 30 percent in gasoline bills.
7. Brings engine to the highest possible efficiency.



Showing the GASOLATER installed on a Zenith Carburetor.

To Attach GASOLATER

To attach Gasolater, simply remove the two bolts binding Carburetor to Intake Manifold, insert Gasolater and rebind with longer bolts furnished with the device. The Carburetor must then be cut down to about three-fourths of one turn, which is usually the right adjustment.



Retail Prices

1 inch size (Ford) .	\$ 7.50
1 1/4 inch size	10.00
1 1/2 inch size	12.50
2 inch size	15.00

Plus 5 per cent War Tax.

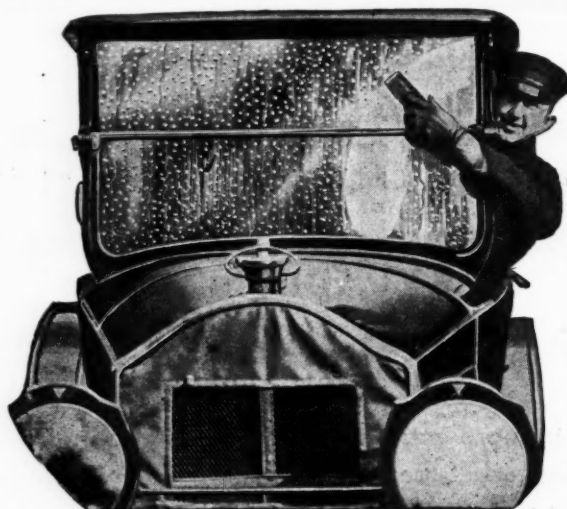
Liberal discounts are made to both the Jobber and the Dealer. Write for them.

The GASOLATER is going to make a lot of money for both Jobbers and Dealers. If you want to get in, write for our proposition at once.

**Martin-Lumaghi
Manufacturing Co.**

Saint Louis, U. S. A.

*A black-board eraser
CLEARS the board, but
does not keep it clear.*



*This new scientific eraser
keeps your windshield clear
FOREVER. Price \$1.00*

TRADE MARK RAINY RACER • SCIENTIFIC •

A wonderful new discovery! The first application of this chemical principle to automobiles. It will insure your safety.

Here is a new chemical device which is entirely different from mechanical arrangements. No fixing or adjusting—just one sweep across your wet windshield and the troublesome, dancing, dazzling raindrops vanish instantly—leaving just a thin film of water—clear as a crystal.

Rainy Racer acts scientifically—not mechanically. The raindrops are broken up by a very small quantity of chemical with which the wick is impregnated, resulting in a film of water, laid evenly over your windshield. It does not contain oil or grease compound to collect dust and dirt.

One application outlasts the rain.

You need not fear to drive in the rain with a Rainy Racer in your car.

DEALERS! Note these six points:

1—There is a well organized demand for a practical windshield clearer which does not clutter up the windshield with a special device and is not a greasy dust-collector.

2—Rainy Racer is priced at \$1.00—much less than the ordinary windshield clearing device—and has the advantage of being very simple and does not have to be attached to the shield.

3—It is covered by an absolute

iron-bound guarantee to do the work.

4—Discounts are liberal so that you make a good profit and still offer the device below the price of the ordinary windshield clearer.

5—It was designed on a scientific basis, has proved its ability to do what is claimed for it, and is manufactured by a strong company. Counter-displays and other advertising material are furnished.

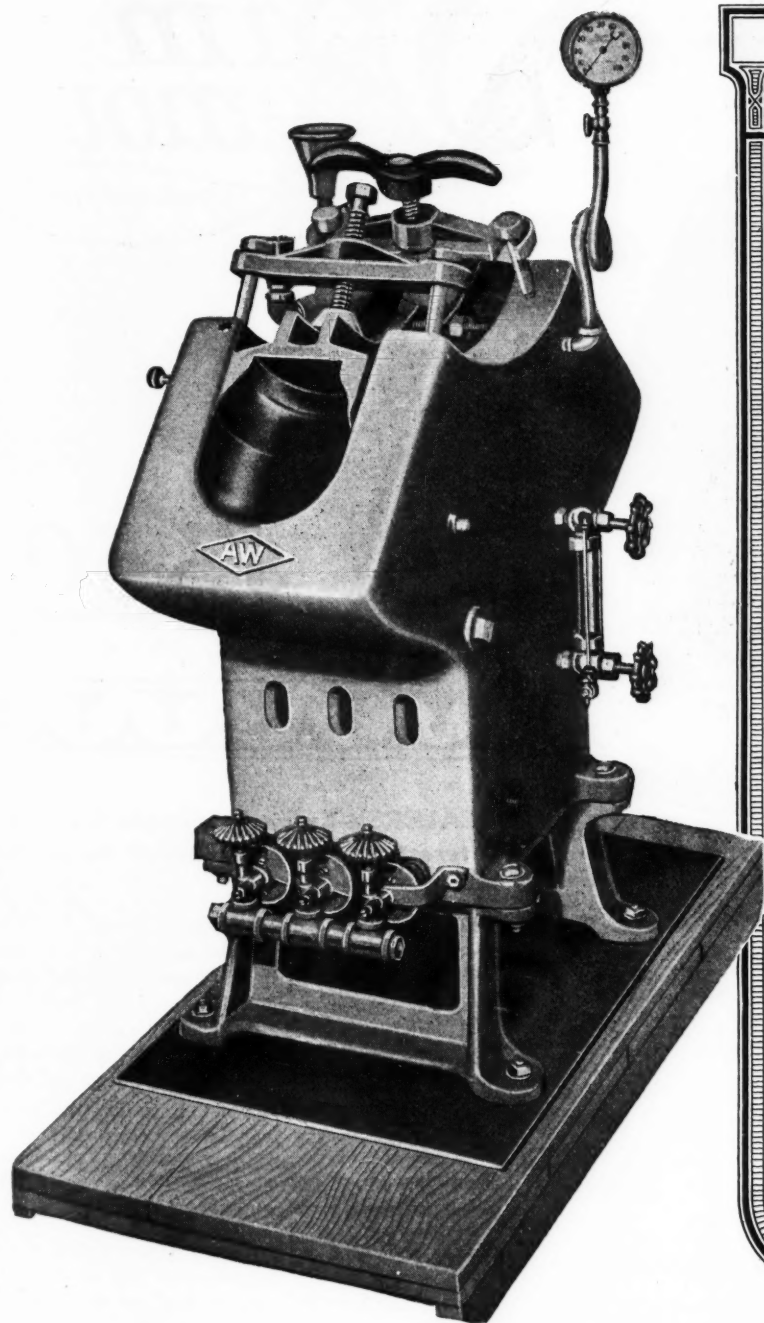
6—Rainy Racers are now being turned out in large quantities and we can make immediate delivery. Get in at once on this new device and be ready to meet the demand. Either ask your jobber or write today for our proposition. Send a dollar bill for a sample device. The regular dealer discount on this sample will be credited against your first order.



RAINY RACER COMPANY

Office & Factory: 3-5 E. Redwood Street,
Baltimore, Maryland

Start with One Vulcanizer—Add More As Your Repair Business Grows



Everything in Tire Repair Machinery and Tools

ONE Akron-Williams Vulcanizer starts you towards having a complete Akron-Williams shop.

Because when you see the superiority of Akron-Williams performance you'll want every piece of repair apparatus to bear the A-W trademark.

The repairs will be—

BETTER—

and **FINISHED WITH LESS WORK ON YOUR PART.**

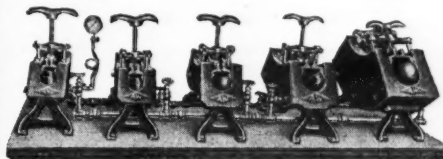
FAULTY REPAIRS AND THE RESULTING WASTE MATERIAL PRACTICALLY ELIMINATED.

Business boosted by **ENTHUSIASTIC CUSTOMERS.**

One piece of Akron-Williams repair apparatus in a shop gradually changes it to an exclusive Akron-Williams tire repair plant. Akron-Williams accuracy, simplicity and high quality rapidly increase your repair profits.

Write us about your repair machinery needs. Our consulting engineers will advise you without charge.

**The Williams Foundry
& Machine Co.
Akron, Ohio**



Here is a battery of Akron-Williams sectional vulcanizers, all heated by the same steam generator.

This battery enables you to handle repairs on auto tires from 2½ inches to 6 inches in diameter.

Any desired combination of molds furnished separately or mounted together. One pair of crucible steel machine-finished bead molds with each mold.

Large illustration at left shows sectional vulcanizer equipped with its own steam generator operated by gas or gasoline.

A-W

Akron-Williams

TIRE REPAIR EQUIPMENT

When Writing to Advertisers, Please Mention Motor Age



Simplex Rim Remover

NISWANDER PATENTS

\$3.50
EACH



Many
Others
on File

DEALERS—Every Automobile Owner is an *Interested* prospect. Think of the unlimited sales opportunity.

This simple, strong and compact device is different from any rim remover on the market. It is the result of careful study and improvement—repeatedly tested—and it has never yet failed to do its work quick and with remarkable ease.

Motorists and truck drivers proclaim it the most essential device, in their tool kits—a device which they wouldn't sell at any price if they couldn't get another **SIMPLEX**.

Read the letter from an actual user. We have hundreds of such letters on file.

Use a **SIMPLEX** in your own shop. Put in a stock of these fast selling rim removers and be the dealer in your territory to "cash in big" on the **SIMPLEX**.

Write us for full details of our attractive selling arrangement for dealers

SIMPLEX STEEL STAMPING CO.
1909 Shenandoah Ave.
St. Louis Missouri



Ask Your Mechanic!

IF you want straight talk on tools, ask your mechanic or your garage man what he thinks of Billings & Spencer.

Tools are the biggest thing in his working life. They make all the difference between the good job he's proud of and the bungle he hates.

Ask him.

He will tell you it's a matter of just-right steel—hard enough to stand the most strenuous service without denting—yet not so hard as to be brittle.

And a matter of perfect fit to the nut engaged—a matter of jaw shape, for the right wrench makes a clean tight job of every twist, even when you put your weight into it.

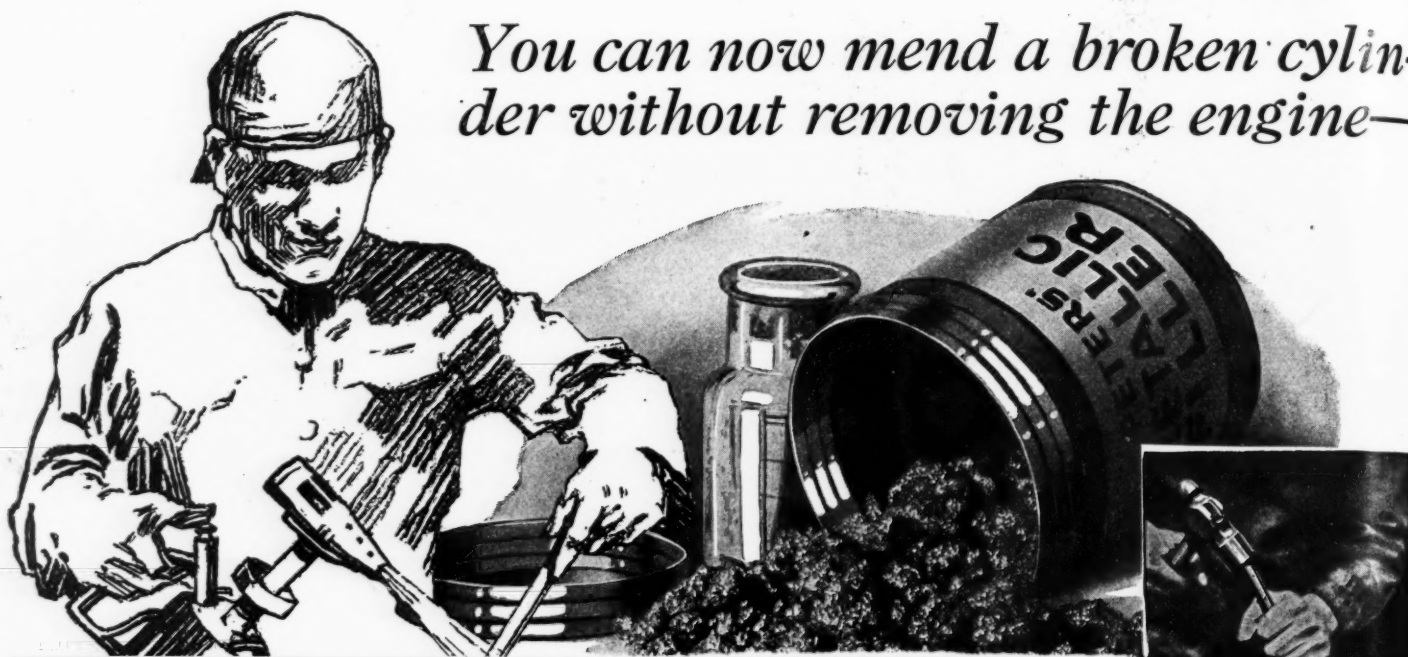
You who buy tools may safely take a workman's word for what is right.

After all, it is more than a wrench you buy. It is hours of service and years of satisfaction instead of months of trouble. Your hardware dealer will nod approvingly when you look for that Triangle B. Several thousand men have worked fifty years to make it worth looking for.

"Rely on Me"
The Billings & Spencer Co.
 Hartford  Conn. U.S.A.
 The First Commercial Drop Forging Plant in America.

When Writing to Advertisers, Please Mention Motor Age

You can now mend a broken cylinder without removing the engine—



Any crack in cast iron, brass or bronze can be permanently and easily repaired

THANKS to Mr. Peters, car and truck operators and repairmen are now able to do in a few moments' time what formerly required hours of irksome labor and destructive heat.

No skilled labor is required. Any novice can make a perfect repair, by following the simple directions. All he needs is an ordinary blow torch to heat the Filler to its melting point—which is only 300°. This low temperature cannot possibly warp or otherwise distort the casting.

The discovery of Peters' Metallic Filler replaces the old method of brazing whereby the casting must be heated to a cherry red with all the consequent dangers of cracking, distorting and warping. Likewise it renders obsolete the old process of welding which required slow preheating and subsequent annealing.

Do not confuse Peters' Metallic Filler, which is a metal and makes a permanent repair, with cement, which is merely a paste.

Peters' Metallic Filler is the invention of a famous metallurgist, who studied hard and long to produce a brazing compound that would replace welding and other dangerous high temperature methods, and would do the work quickly, easily, cleanly—and cheaply.

The cost of a repairman's package of Peters' Metallic Filler, enough for a good many jobs, is only \$5.50. The consumer size is \$3.00.

Ask your dealer or jobber—or, if they cannot supply you, order direct.

**ALUMINUM BRAZING
SOLDER COMPANY**

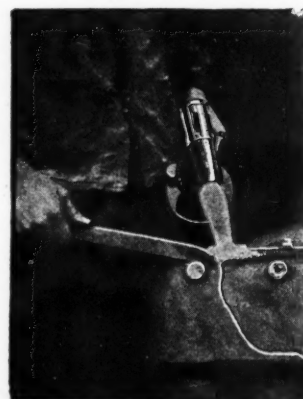
260 Montgomery Bdg. Chester, Pa.

PETERS' METALLIC FILLER

(NICO SPELTER)



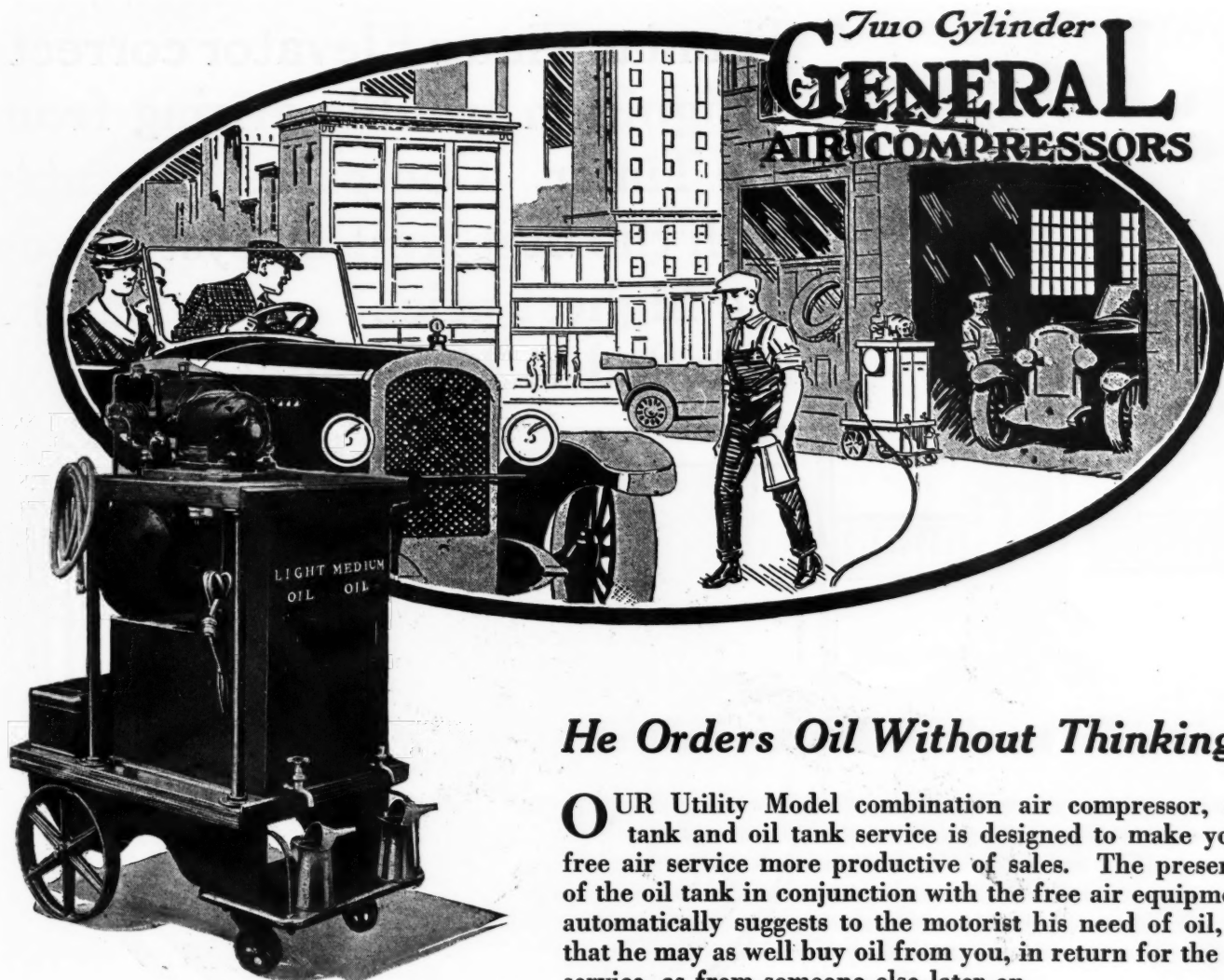
You first clean the crack thoroughly and bevel the edges



Then heat for a moment with an ordinary hand torch (300° ample) and apply the filler



While the hot metal filler is still soft, pack and roll it smooth, dress off with file, and the job is done



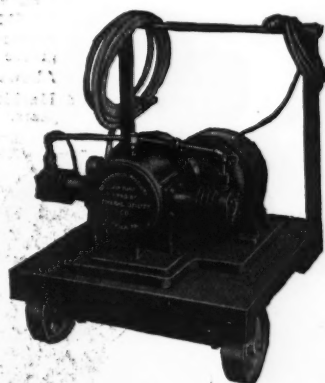
He Orders Oil Without Thinking!

OUR Utility Model combination air compressor, air tank and oil tank service is designed to make your free air service more productive of sales. The presence of the oil tank in conjunction with the free air equipment automatically suggests to the motorist his need of oil, or that he may as well buy oil from you, in return for the air service, as from someone else later on.

DEALERS and JOBBERS

Write for details of our distributor proposition. We deal only through exclusive distributors and jobbers in each territory. Dealers can get from us the name of our jobber. He can make immediate deliveries. Jobbers in unclosed territory should get our proposition.

Our booklet, "The Low Cost of Cool Air," will tell you all about our line.



In this way the pump pays for itself in oil sales, without a word from you.

Two-cylinder General Air Compressors are high grade pumps. They furnish 5000 cubic inches of cool clean air per minute. They inflate an average size tire in 2 minutes.

UTILITIES SALES CORPORATION

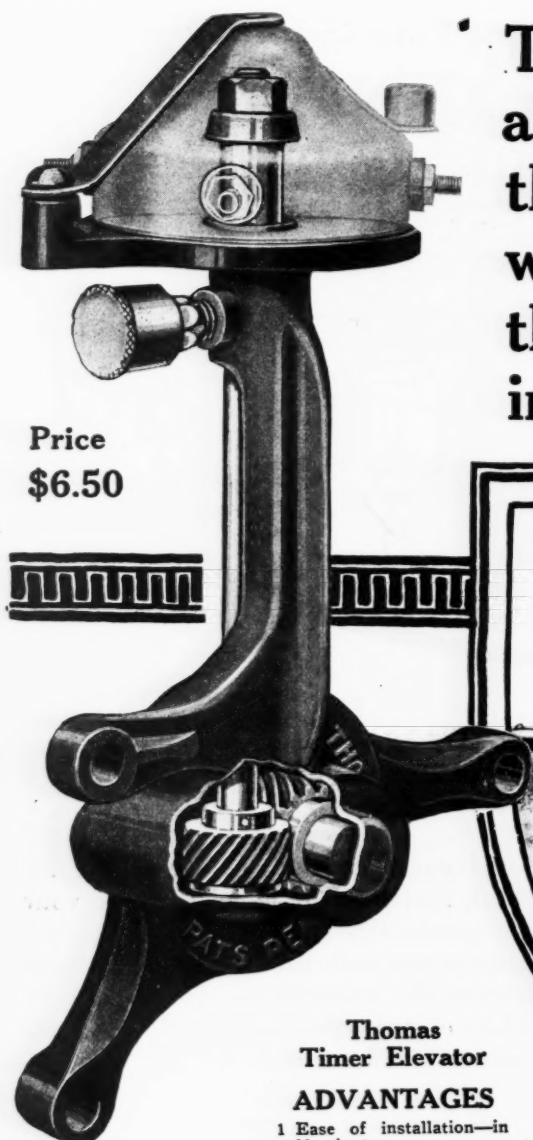
Sales Representatives

GENERAL UTILITY COMPANY

Factory 1524 Ogden St. Philadelphia Office 809 New Stock Exchange Bldg. Philadelphia

Utilities that Sell Because They Serve

When Writing to Advertisers, Please Mention Motor Age



Price
\$6.50

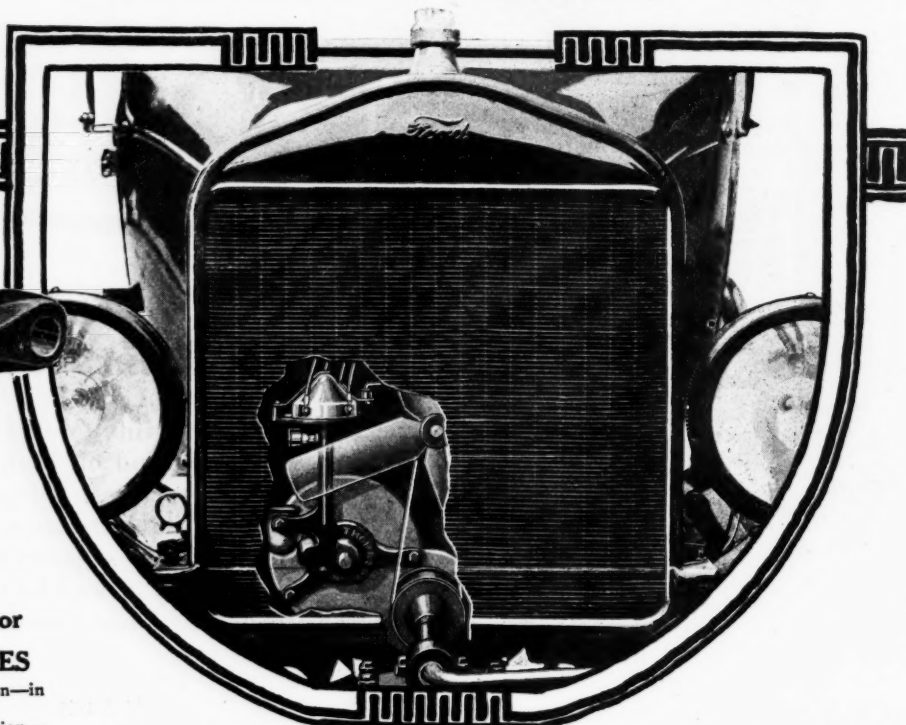
**Thomas
Timer Elevator
ADVANTAGES**

- 1 Ease of installation—in 20 minutes.
- 2 Simple in construction—fits any timer.
- 3 Protects against oil, dirt, grease and water.
- 4 Allows overhead wiring.
- 5 Machine-cut, spiral steel gears.



Thomas
Timer
\$1.50

Thomas Timer Elevator corrects all ignition trouble arising from the Timer. Compares favorably with the best ignition systems on the highest price cars. Can be installed in 20 minutes.



DEALERS All Ford Owners Are Thoroughly Sold on This Elevator at Sight

The Thomas Timer Elevator

The Thomas Timer Elevator corrects ignition troubles by lifting the Timer up where it remains clean and is easy to get at.

By employing the Thomas Elevator, the wiring is overhead—where it belongs—and compares favorably with the most expensive ignition systems. The Thomas Timer Elevator can be installed in 20 minutes without any special tools. It is not necessary to remove the radiator. *Any Timer made to fit a Ford will fit the Thomas Timer Elevator without making any changes.*

THE THOMAS TIMER

The Thomas Timer employs the wipe contact principle which is recognized in the electrical field as being the most satisfactory. Contact is always made at exactly the right time, thereby assuring four perfectly balanced explosions. An outstanding feature of the Thomas Timer is the fact that worn parts can be replaced in a few minutes for a few cents, which is not practical with a roller type Timer.

The Thomas Timer is guaranteed for one year from date of purchase.

THOMAS Products Are Sold Through Jobbers

Thomas Andrews Corporation - - Chicago

Department of Sales 624 Michigan Ave., Chicago
Factory Waukegan, Illinois

**Now
Ready!
Get Your
Copy**

THE new Harvey Spring Book is even more complete than any of its predecessors. Lists over a thousand different springs with specifications and prices. Every Harvey Spring is specially designed for the particular car on which it is to be used. And every Harvey Spring is built so carefully and put through such rigid tests that we are absolutely safe in guaranteeing it against breakage or sagging.

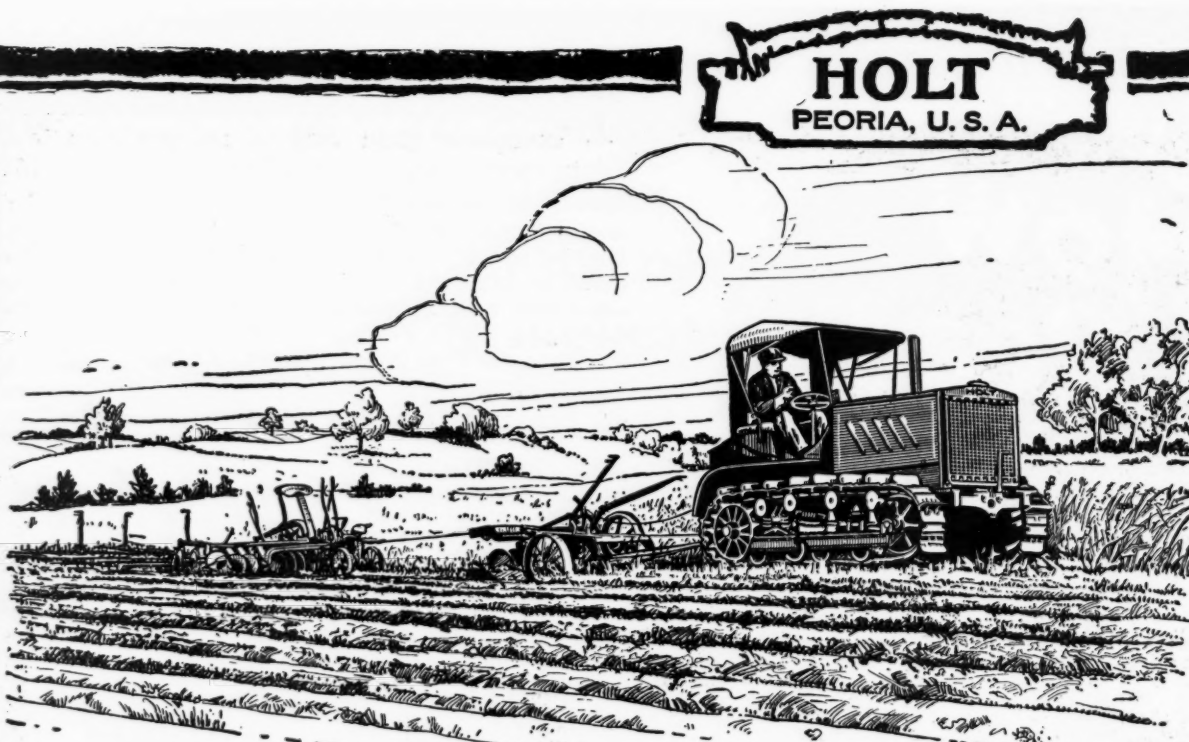
Write to your jobber or to us for
copy of the new Harvey Book

Harvey Spring & Forging Co.

1007 17th St., Racine, Wisconsin, U. S



Harvey Dealers are well supplied with general sales helps—striking window decalcomanias, moving pictures, slides and inside wall posters as well as the Harvey Spring Book. There's a Harvey Jobber near you ready to make immediate delivery on any Harvey Spring you want.



Do you **KNOW** this Tractor?

THE Holt "Caterpillar" is now available for agricultural and commercial purposes. In 1914 the "Caterpillar" was exclusively adopted by the British War Department for military purposes. In 1915 the "Caterpillar" (heavy type) was converted by the British War Department into the world-famous "Tanks." In 1916 the "Caterpillar" was exclusively adopted by the French War Department and also applied in prin-

ciplē to the French "Tanks." In 1916 the "Caterpillar" was exclusively used by the U. S. Army on the expedition into Mexico. In 1917, after months of extensive tests and demonstrations, the "Caterpillar" was awarded *exclusive military recognition by the U. S. Army* for motorizing the Artillery forces, and later was applied in the manufacture of "Gun-Mounts," "Tanks," "Cargo Carriers" and other equipment. No other type of traction could meet the exacting conditions demanded for war work.

"CATERPILLAR"

REG. U.S. PAT. OFF.

The more you know of the Holt "Caterpillar" and of its history during the past four years, the more you will feel sure that this Tractor is the one you have always wanted—the Tractor that you can absolutely depend upon to do your work when and as it should be done. You can now change from the known reliability of horses for your field work to the more economical, more reliable "Caterpillar," with full assurance that you will be the gainer in every way by the change. Whether or not you saw the "Caterpillar" at the

Wichita Demonstration, write us for the story of its work in peace and war. **KNOW** the "Caterpillar." The knowledge will be of service to you.

The important fact that we wish to drive home is the dependability of the "Caterpillar"—its flexibility and usefulness in a most diversified field. "The Caterpillar" dealer commands the very best trade in any territory. We will be glad to send you further agency particulars upon request.

not a 'type' but a Tractor—Holt builds it

The 5-ton "Caterpillar" (U. S. A. Ordnance type), illustrated above, will develop 3600 pounds drawbar pull under normal conditions; at least four 14-in. mould board plows is a conservative load where plowing conditions are at all fit. It carries and lays its own track; mud, soft soil and sand offer no obstacle whatever, as this

tractor was designed to negotiate shell holes and trenches of the war-torn fields of Europe.

It can turn in its own length—making close fence corner work quite possible. It is equipped with three speeds and reverse—will travel on the road, if required, as fast as 8 miles per hour but on plowing work its direct speed at 900 R. P. M. is a bit less than three M. P. H. High speed plowing is what we are coming to, so keep this feature well in mind.

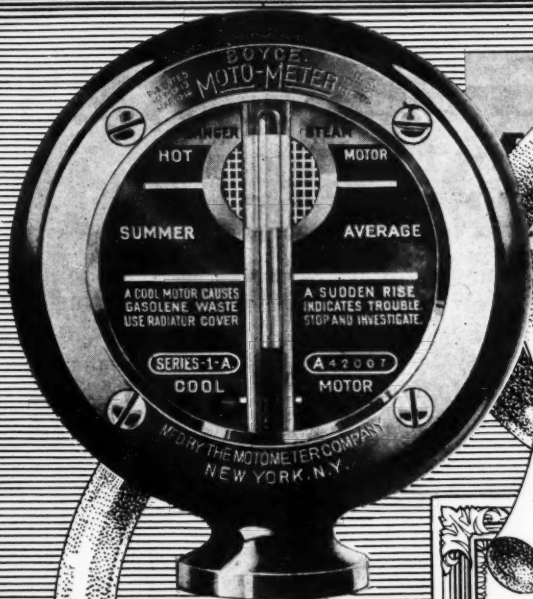


Following our extensive production for war purposes, we can now make immediate deliveries on all models

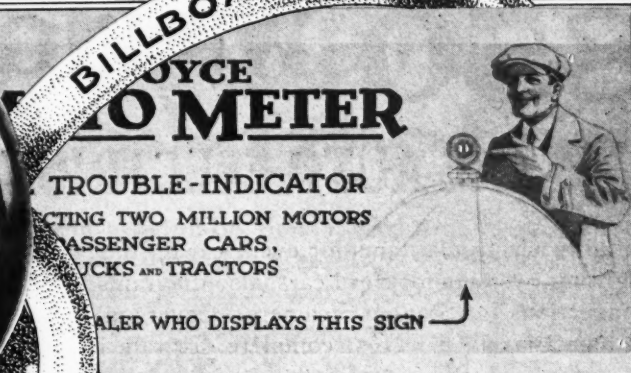
THE HOLT MANUFACTURING COMPANY, Inc. PEORIA, ILLINOIS
 NEW YORK CITY OFFICES 50 Church Street
 SOUTHWESTERN OFFICES Wichita, Kansas
 F. L. HALLORAN Union Ave., Memphis, Tenn.
 YANCEY BROS. Distributors, Atlanta, Ga.

CATERPILLAR
 Reg. U.S. Pat. Off.

When Writing to Advertisers, Please Mention Motor Age



BILLBOARDS



**The
Connecting Link is
Up to You,
Mr. Dealer**

*Mahogany Display Stand
(19" x 11 1/4")
For your counter*



Sell BOYCE MOTO-METERS and link yourselves up with big advertising and selling helps.

The "BIG THREE SALES HELPS" composed of handsome DISPLAY STAND, "FREE DIAL" BOARD, and SERVICE SIGN will be given to a car distributor, dealer or garageman who places an order for ten or more assorted Boyce Moto-Meters, one delivery.

For further information on the fastest selling accessory on the market write to

THE MOTO-METER CO., Inc.
Long Island City N. Y.

*Mahogany "Free Dial" Board
(20 1/2" x 14")
For your wall*

*Attractive four color Service Sign
(26 3/4" x 19")
for your window*



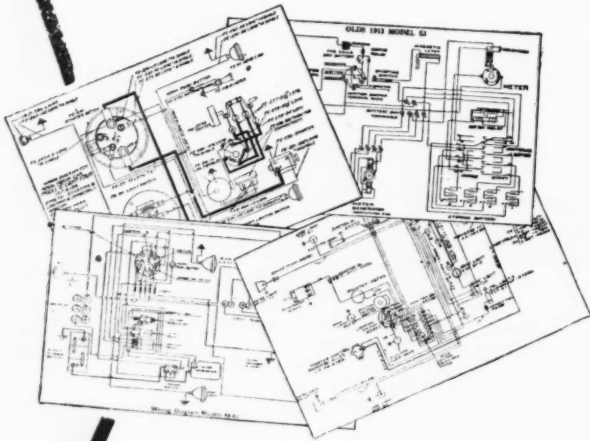
SERVICE SIGN

**We Install the
BOYCE
MOTO-METER
" Free "**

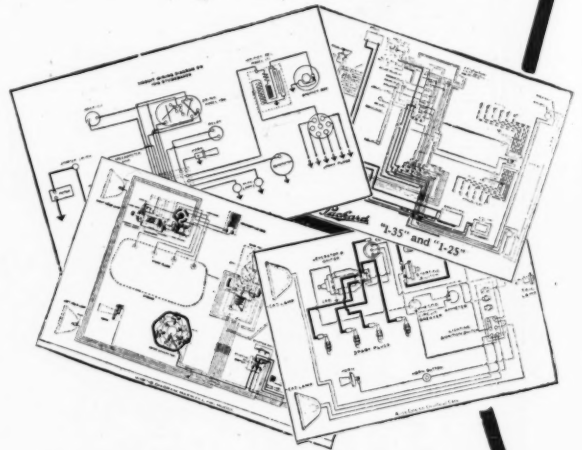
850 WIRING DIAGRAMS

In New Edition of THE AUTO ELECTRICIAN'S GUIDE

Contains wiring diagrams for every car on the market, including the new 1919 Starting and Lighting Systems for Ford cars, also diagrams for Baker R & L and Detroit Electrics and pipe connections for Stanley Steamers. Covers all kinds of systems from 1912 to 1919 and many as far back as 1906. Most complete diagram book on the market.



**They
Make
Wiring
Problems
Easy**



Highly Endorsed by Auto Manufacturers, Garages and Service Stations

No problem too puzzling if you have the Auto Electrician's Guide. ANY "OLD STICKER" QUICKLY SOLVED with the help of this book. Saves hours of time on both old and new jobs. Impossible for even experts to know all cars but no car will "stick" you when you have this book. A practical, easily understood "guide" that will simplify all auto-electric

problems and make it possible for you to quickly overcome hundreds of starting, lighting and ignition troubles which otherwise would take hours to solve. Extensively used all over the country. Hundreds of auto experts and repairmen depend on it to solve hardest problems. Dozens of letters received telling of its exceptional value. Read the following:

JOHN P. DODGE

ORACE B. DODGE

DODGE BROTHERS

MAKERS OF MOTOR VEHICLES

DETROIT, U.S.A.

"Gentlemen: I am in receipt of your book, 'The Auto Electrician's Guide,' for which please accept my thanks. We find this a very complete and valuable book and one that I have been exceedingly anxious to get hold of for some time. I not only find this book complete in every detail, but simple and easily understood. It is a book every dealer or garage owner should have."

(Signed) H. M. Wiegand,
Final Inspection Dept.

Westinghouse Electric & Manufacturing Company
SERVICE DEPARTMENT



EAST LIBERTY P. O. STATION, PITTSBURGH, PA.

"Dear Sir: Referring to your letter of October 18th, with reference to 'Auto Electrician's Guide,' I am very glad to advise that the 'Guide' has come to hand. I find it to be a very valuable handbook, and congratulate you on the arrangement, the completeness of the diagrams and its general usefulness to the automobile trade."

"If you publish any supplements or additional sheets for this Guide, I would be very glad to receive copies of same, and if we can assist you in any way with information pertaining to our apparatus, I would be very glad to do so."

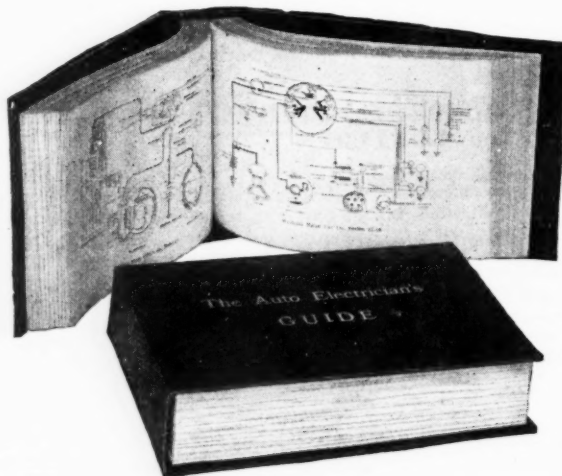
(Signed) Automobile Equipment Service Dept.,
W. I. Everett, Supt.

Ward Leonard Electric Company

ELECTRIC CONTROLLING DEVICES

"Dear Sir: I have carefully viewed your 'Auto Electrician's Guide,' and have had our Superintendent go over it also. We are much pleased with it. I think it is indispensable to garage men and to men who are doing active work on different makes of cars. The only criticism I can make is that the indexing might be improved, although after studying it I cannot suggest a method of improvement. You have handled a difficult subject very well indeed."

(Signed) Ward Leonard Electric Co.,
D. J. Burns.



A LOOSE LEAF BOOK

—Easy to handle and easy to add new diagrams as issued. Convenient to slip into the coat or car pocket. Invaluable as a constant companion to repairmen. Scores of trouble cases quickly and easily corrected with the help of this guide. Price \$7.50 plus postage to your city. Shipping weight 3 lbs. Include postage with remittance. Money refunded if not satisfied. Order Direct. Send Today.

PRICE \$7.50. Remit by Post Office Money Order
or Bank Draft. ORDER DIRECT. SEND TODAY.

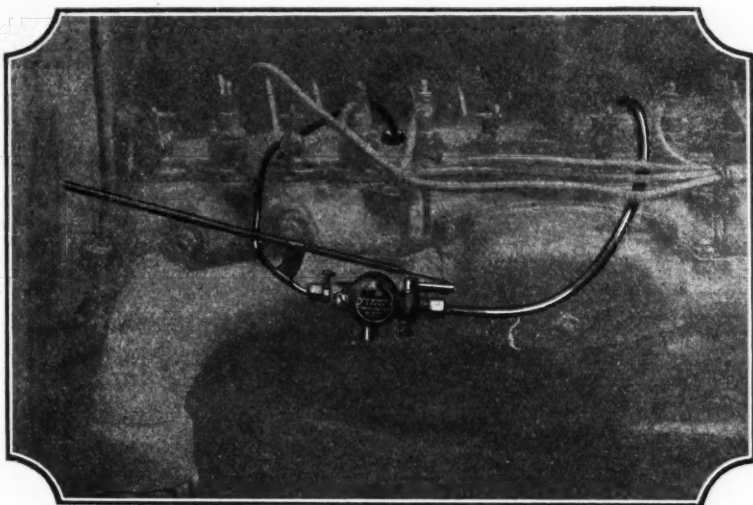
Michigan State Auto School
2827 Auto Bldg., 687-91 Woodward Ave., Detroit, Mich.

When Writing to Advertisers, Please Mention Motor Age

The Automatic Steam Carburetor

This is the first trade journal announcement of the Automatic Steam Carburetor—a wonderful new invention which you can guarantee to save 25% to 40% of gasoline, kerosene, alcohol or benzol, in any combustion engine—automobile, truck, tractor, motor boat or aeroplane.

It Makes Dollars for You While it Drives the Devil Out of Motors



The Automatic makes you a big profit—50% on your cost—and wherever motorists have heard of it they are waiting impatiently to get one. It injects live steam into the mixture, which every practical man knows, and we guarantee, will increase combustion, keep spark plugs clean, eliminate carbon (the "Devil" that makes trouble with motors), keep the intake manifold hot, save cleaning and repair bills, increase speed from five to seven miles per hour, give the motor more power and pep, and we also *guarantee that it will save 25% to 40% of fuel.* A

test car ran 16,000 miles without removing carbon, and was in good condition.

Big Newspaper Campaign Now Running

It is our intention to advertise the Automatic Nationally. Already one big newspaper campaign has started. Send for dealer proposition. See what a novel plan we have to help you sell the Automatic. Get it now. Be the first in your city to get it. It means a lot of *extra profit* that you are not now making. The Automatic is easy to install. You need no special equipment.

But act now! Tear this ad out, write your name and address in the margin and send it to us. By return mail you will get full information about the Automatic Steam Carburetor, and our liberal money-making offer for you. But do it! Tear out the ad. You can't afford to let a competitor beat you to it.

Automatic Steam Carburetor Co.

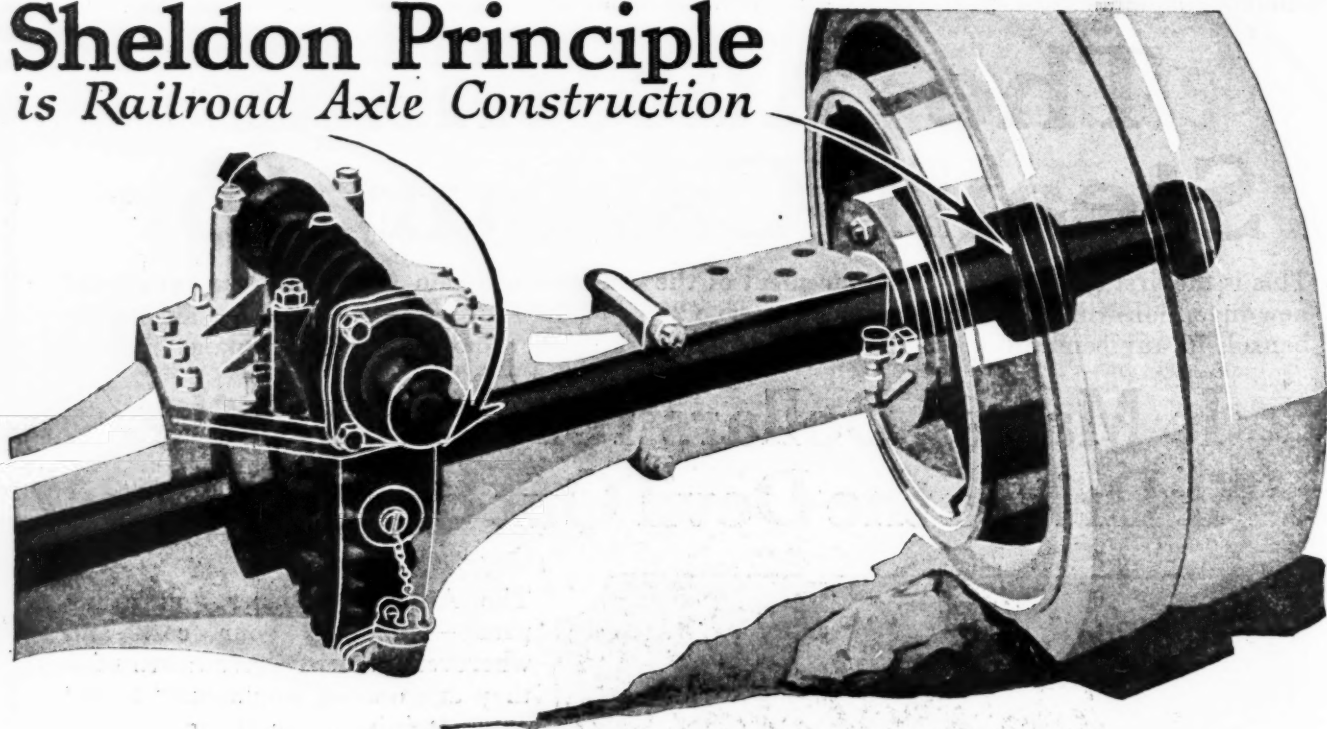
All Phones Belmont 7932

2490 Milwaukee Ave.

CHICAGO

TO CAR OWNERS! The Automatic Steam Carburetor is *guaranteed* to do everything claimed for it in this advertisement and you have 30 days' trial! If your dealer does not handle it, send your order to us direct. We will ship you a Carburetor and offer to give your dealer credit for the sale.

Sheldon Principle is Railroad Axle Construction



TO gain greatest strength on locomotives, freight, and passenger cars, the wheels are fixed rigidly to the revolving axle. This permits of wide spread of bearings and a long leverage to hold the wheels steady against side strains.

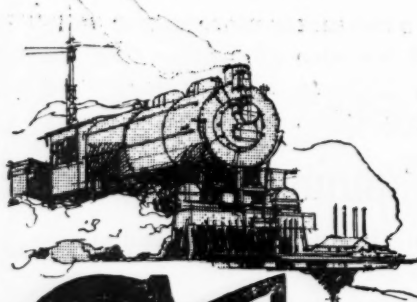
This is the Sheldon Principle. On crowned roads, cobblestones, street-car tracks, slippery pavements, there are frequent side strains on the wheels.

A bearing at the hub and one at the differential end of the axle give the long leverage that means stability. It is the difference between locomotive and animal-drawn construction.

The Sheldon Principle is employed in transporting the freight tonnage of the world.

Send for catalogue explaining the Sheldon points of superiority

SHELDON AXLE & SPRING COMPANY, Wilkesbarre, Pa.



Sheldon

AXLE

FOR MOTOR TRUCKS

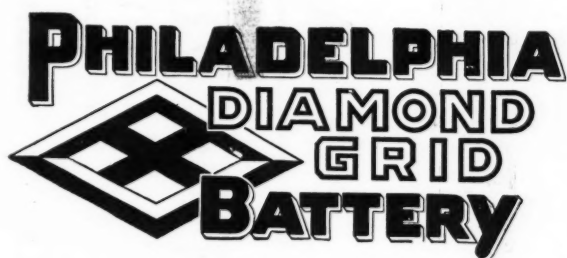


The above advertisement is appearing in the Saturday Evening Post and other publications of importance.

COMING—

The "CORD TIRE"

Among Storage Batteries!



On or about September 1st, we will announce a new storage battery.

We are certain of its supreme merit. Our engineers have been experimenting with it in countless forms and sizes for the past five years. In grueling laboratory tests it has outlasted and out-performed any other battery we could buy or build. Thousands have been used in actual war service in the U. S. Navy.

The new battery stands in the same superior relation to any other battery as the cord tire to the fabric tire.

And just as surely as the coming of the cord tire upset and gave new impetus and new standards to the tire market, so this new battery will open up new possibilities in the storage battery business.

It will be advertised—far more intensively and extensively than we have ever advertised before.

It will set a new high water mark of perfection that will make it easy to sell—even easier than the present Philadelphia Diamond Grid Battery.

In the past, Philadelphia Diamond Grid Service Stations have been remarkably successful because they had a good battery that was easy to sell. Now their position will be even stronger. They will be able to offer the only "cord tire" among storage batteries.

Can you afford to sell nothing but "fabrics?" Write for our proposition today.

Watch for the announcement of the new battery on the covers of the Saturday Evening Post, Collier's, and the Literary Digest.

Philadelphia Storage Battery Co.
ONTARIO & C STREETS PHILADELPHIA, PA.

Sales Offices:

Rochester, N. Y.
30 Carlton Street.
New York, N. Y.
1739 Broadway
Cleveland, Ohio.
613 Citizens Building.

Columbus, Ohio.
318 First National
Bank Building.
Atlanta, Ga.,
128 W. Peachtree St.

St. Louis, Mo.,
2605 Locust Street.
Los Angeles, Cal.,
1105 West Pico Street.
Minneapolis, Minn.,
1122 Harmon Place.

Chicago, Ill.,
1621 S. Michigan Ave.
Pittsburgh, Pa.,
302 Park Building
Huntington, W. Va.,
Hotel Huntington.

San Francisco, Cal.,
37 Spear Street.
Wilkes-Barre, Pa.,
20 Poplar Street, Dor-
rancheton.

Washington, D. C.,
2155 Champlain Ave.
Boston, Mass.,
90 Brookline Avenue.

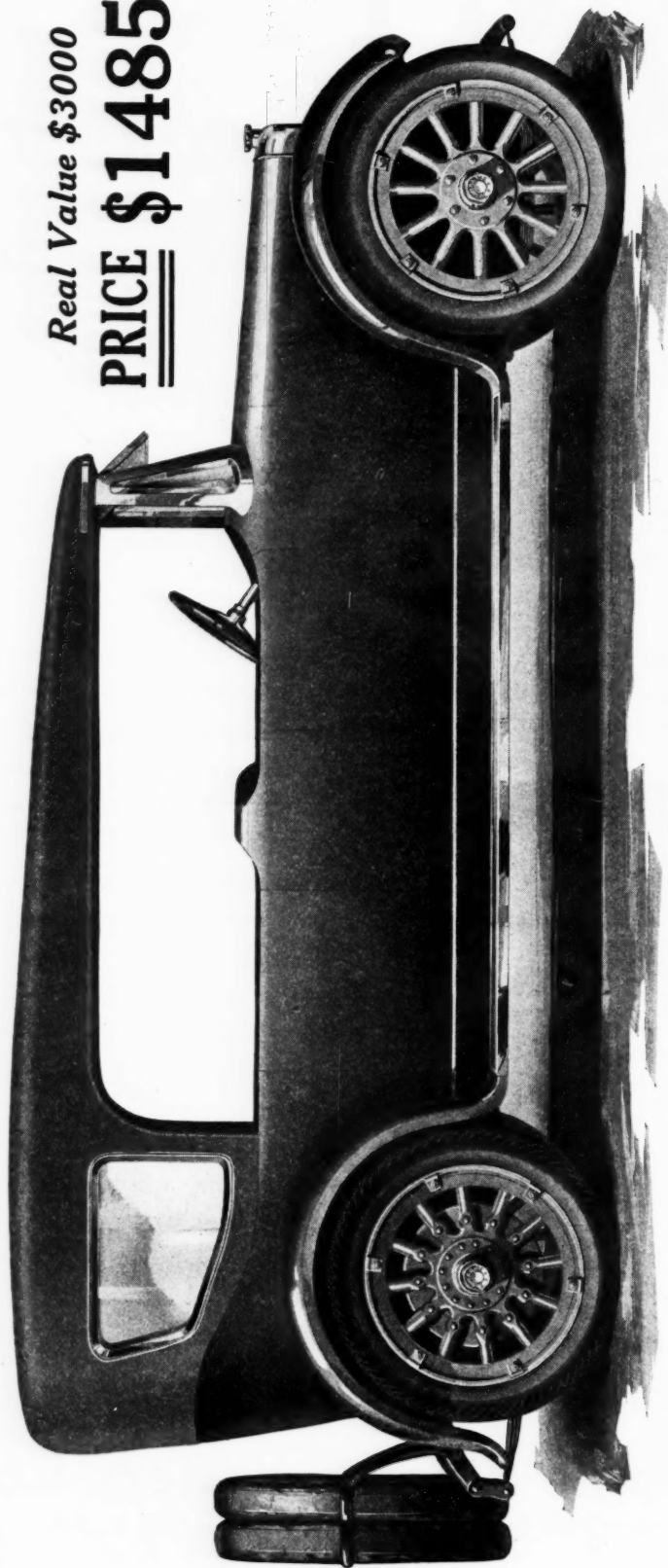
When Writing to Advertisers, Please Mention Motor Age

"LAMARNE" The Great Sensation of 1920

SEMI ENCLOSED CAR

Real Value \$3000

PRICE \$1485



"LAMARNE"

Motor—8 Cylinders—Vertical Type
 $3\frac{1}{4}$ " bore; $5\frac{1}{2}$ " Stroke
 Hp. 33 S.A.E. Developing 85.
 Wheelbase, 128"—Overall 15 feet.
 Weight 2900 pounds.

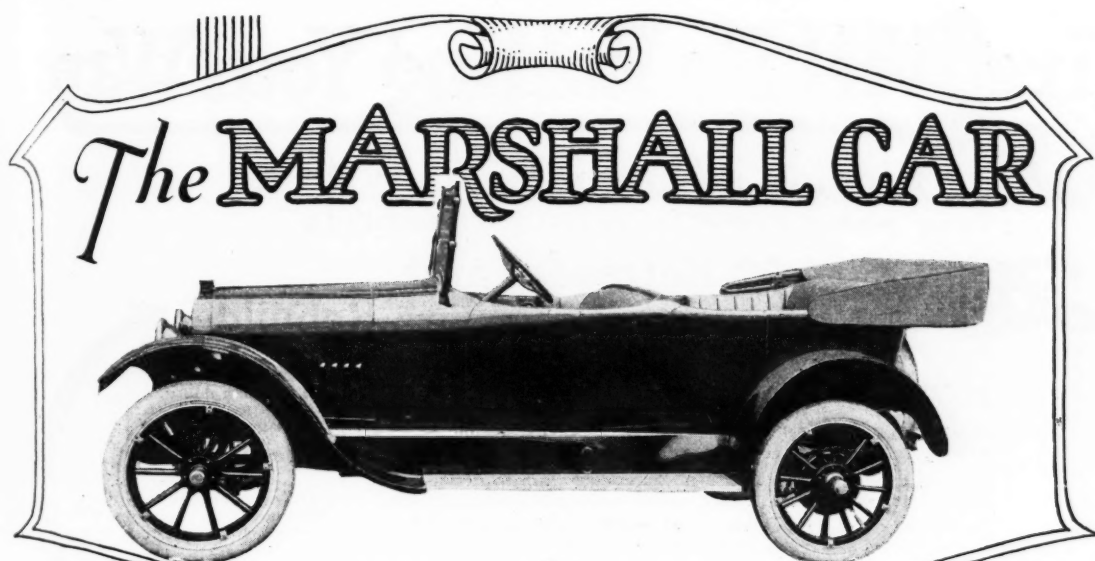
LIVE WIRE AGENTS WANTED

*Write, Wire or Come to close contracts.
 No deposits required with financial references.*

LAMARNE MOTOR CAR CO.

Finney Avenue

CLEVELAND, OHIO



Dealers—

Send for our new illustrated catalog. The designs will appeal to you. Our co-operative dealer's selling arrangement is extraordinary.

Marshall Quality stands out prominently in every Marshall passenger or commercial vehicle—a quality which has been built up on an everlasting effort to produce the utmost in Strength, Beauty and Economy. Marshall vehicles are built with a “promise”—a promise that they are mechanically right clean through—and will stay right.

The Marshall one year guarantee stands back of this “promise” and insures the best of factory service at all times.

Marshall dealers, everywhere, have outsold their schedules. In order to supply the exceptional demand, our facilities have been taxed to the utmost. We have met the situation successfully and are now able to supply cars promptly to present dealers—and also to new dealers.

Marshall Manufacturing Co.
780 Milwaukee Ave. Chicago

Every Tire Will Be Rolling Your Way

Bringing a Dandy Profit With It
when car owners know that you've installed a

Zwebell Retreader and Tire Rebuilder

RETREADING of Tires is as Logical and in as
Steady Demand as Resoling of Shoes.

This machine is simple—easy to operate—nothing complicated—exceptionally compact and sturdy construction.

It comes to you complete with all necessary clamps, bars, bags, etc., ready to set up and run.

The range of this machine is so flexible that it will handle everything that comes into a tire repair shop.

Combination of Uses:
Ordinary Blowout and Sectional Repair Work, Rim Cuts.
Spot jobs on plain, ribbed or non skid tires.
Ribbed Retreading, Plain Retreading, Non-Skid Retreading.

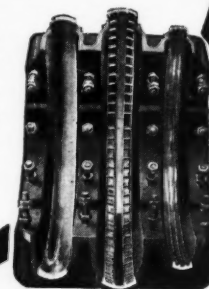


Tire after rebuilt
on ZWEBELL
Retreader.
Good for 3500
to 6000 Miles.

Different patterns shown in the view at the right. Easily interchangeable. Note extended aluminum Matrix to prevent overflow.
Send for complete details and sample section of retreaded tire.

Zwebell Bros. Co.

MILWAUKEE, WIS. Dep. E



Distributors in all leading cities of U.S. will be glad to give you particulars in person—or write us, and we will have our nearest representative give you our proposition.

The Automobile Repairman's Helper

By S. T. Williams



Contents by Chapters

1—Inspection and Lubrication. 2—Drills, Taps and Lathes. 3—Straightening Mudguards, Body Lamps and Other Parts. 4—Simplified Directors for Welding. 5—Cylinder Piston and Piston Ring Work. 6—Ball, Taper and Roller Bearings. 7—Storage Battery Care and Repair. 8—How to Repair a Top. 9—Timken Rear Axle Adjustments. 10—The Ford. 11—Willys-Knight. 12—The Overland. 13—The Oldsmobile. 14—The Dodge. 15—The Cadillac. 16—The Buick. 17—The Chalmers. 18—The Reo. 19—The Saxon. 20—The Maxwell. 21—The Chevrolet. 22—The Borg & Beck. 23—The Cole. 24—The Northway. 25—The Hudson. 26—The Studebaker. 27—The Oakland. 28—The Liberty. 29—The Paige. 30—The Hupmobile, Series N and K. 31—Standard Adjustment on the Hupmobile, Series R.

A pocketbook for the mechanic, owner, chauffeur, and student, giving in concise form and in consecutive order, every operation required to adjust or repair the troubles likely to be found in all standard cars, with chapters on Inspection and Lubrication, Drills, Taps and Lathes, Welding, Storage Batteries, Cylinder and Piston Ring Work, Bearings, Axle Adjustments, Repairing Tops, Mudguards, Lamps, etc.

For a long time there has been a crying need for a standard work of reference for garage mechanics, and car owners who like to do their own work, that really tells in one, two, three order, the correct method of doing any given job on an automobile.

Twenty-two pages of cross reference index enable the reader to find any item at a glance. The book is printed on medium weight paper so that it may be carried in the coat pocket.

448 Pages.

7x4⁷/₈ Inches, Oblong

317 Figures

Flexible Red Art Leather.

Price \$2.50 Postpaid.

U. P. C. BOOK COMPANY, Inc.

Motor Age Book Department

243-249 West 39th Street,

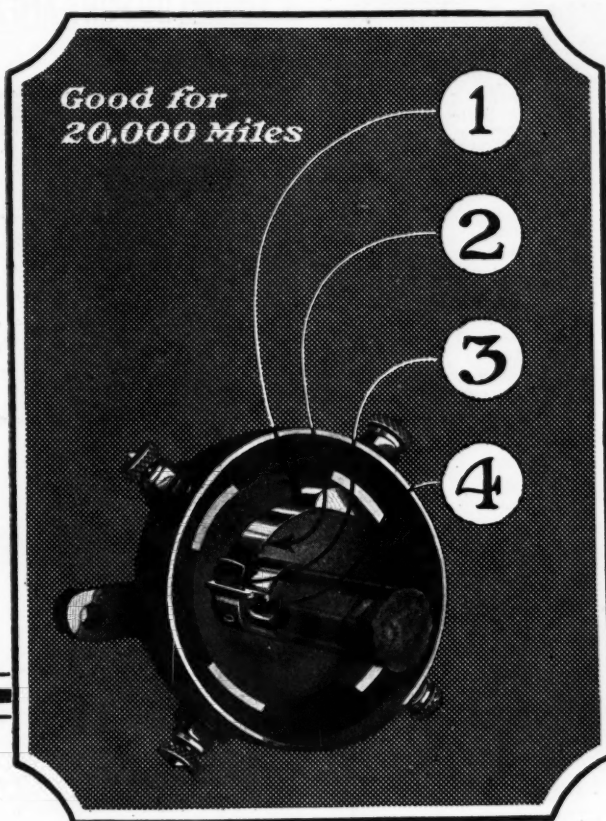
New York

B-11

1. *Rounded contact brush of wear proof hardened steel, insures positive sliding contact with never-a-miss.*

2. *Swedish steel spring, insures an even tension contact at all speeds, and under all conditions of service.*

*Good for
20,000 Miles*



3. *Cushion Spring—acts as a shock absorber for the brush and absolutely prevents "jumping" or breakage in the event of backfire.*

4. *Easy fitting Brush coupling. Fits any standard Ford Timer Shaft and permits use of MILLER "NEVER MISS" Brush with any standard make of Timer.*

The Chief Cause of Timer Trouble

A rolling brush contact soon batters the life out of your Ford Timer—and puts the misfire jinx on your engine

How the MILLER "NEVER MISS" TIMER Solves the Problem

It wears five times longer and better than the ordinary Timer and absolutely prevents misfiring.

YOU never saw a roller brush on an electric generator or motor — it would pound the commutator into useless shape.

And why in the world it's used on your Ford timer is an engineering mystery. By its ceaseless hammering it wears ridges and welts in the contact bed, and then has to hurdle them every time around—raising Old Ned in the engine. Do you wonder your cylinders start misfiring after two or three thousand miles?

Miller did a great service to Ford owners when he invented his "NEVER MISS" Timer. He banished the rough spots, made misfiring impossible, and thereby added thousands and thousands of miles to the life and usefulness of his timer.

He applied the famous electrical "sliding contact principle" to his invention—and there you have it. Contact bed and shoes are always smooth: They never get rough. *They can't.*

You'll get anywhere from 15,000 to 25,000 miles of unfailing service from a single MILLER "NEVER MISS" Timer. Get it for a two-dollar bill—about the tiniest fee you ever paid for a good round period of sparking efficiency.

Take the "Two" to your dealer—or, if he can't supply you, send it to us, together with your dealer's name, and get your MILLER "NEVER MISS" by parcel post, prepaid. Don't try to get along without it, and cheat yourself out of a long spell of real economy. You

can attach it in two minutes. Fits all Fordson Tractors as well as Ford Cars and Ford Trucks.

Dealers: This MILLER "NEVER MISS" Timer can be one of the quickest sellers in your shop. A trial soon convinces. They sell like hot cakes wherever started. One small Kansas dealer with headquarters in a town of 300 population sells 5000 a month. Imagine what you'll do with it when backed by our new sales and advertising plan. Discounts are right. Ask your jobber, or write us.

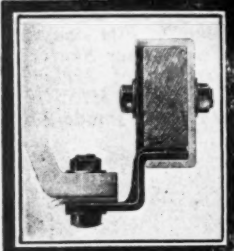
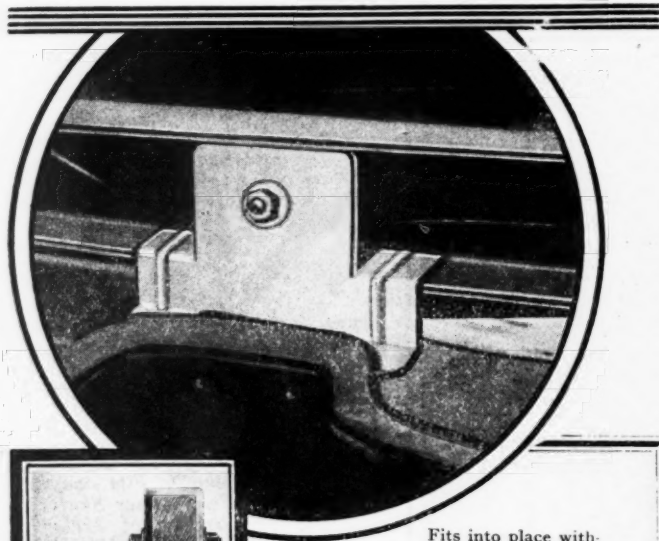
MIL-MAC MANUFACTURING CO.
1714 N. Broad St., Philadelphia, Pa.

The Miller Brush, which makes possible the remarkable efficiency of the Miller Timer, can be purchased separately for use with any standard make of Timer. Even though the contact ring of your present timer is in bad shape the Miller "Never Miss" Brush will wear it smooth again after about 500 miles of service.
List price of Brush only—80 cents.

Miller Never Miss Timer

Sliding Contact Principle

When Writing to Advertisers, Please Mention Motor Age



Fits into place without removing the engine or drilling a single hole.

Supports and holds the crank case better and more securely. Can also be used to reinforce the original Ford arm.

With Speed and Dispatch

You can easily and quickly reinforce the supporting arm of your Ford crank case by fitting the Goodrich Repair Arm over it.

It will greatly strengthen the regular Ford arm. It supports and braces the frame, making the crank case firm and safe against damages permanently.

Or, if the supporting arm is broken, it can be repaired in fifteen minutes with the Goodrich Repair Arm.

Goodrich

CRANK CASE REPAIR OR REINFORCING ARM

You don't remove the engine, you don't drill a single hole. It's all ready to attach by just unscrewing three bolts, and putting them back again.

Don't wait for trouble. Get a Goodrich Repair Arm now. It fits all models of Fords.

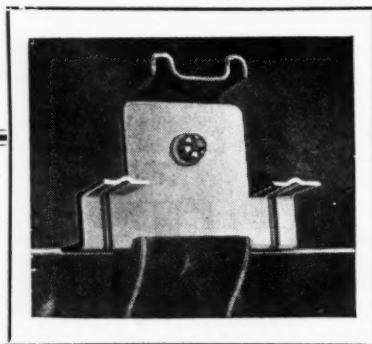
List Price \$1.25

GOODRICH-LENHART MFG. CO

419 Widener Bldg.

Philadelphia, Pa.

Factory
Hamburg, Pa.



DEALERS: Thousands of Ford owners are going to need the Goodrich Repair Arm this year. Jobbers, dealers and repairmen cannot afford to be without it.

DU PONT AMERICAN INDUSTRIES



As Clear As Crystal

The dominant features of Transparent Py-ra-lin Sheeting are flexibility, toughness, clear vision and long service.

TRANSPARENT

Py-Ra-Lin Sheeting

(A duPont Product)

is the first thought of all experienced auto top and jiffy curtain makers. Used now for window materials, goggles, visible card holders and scores of other things.

We also manufacture Py-ra-lin in Ivory, Tortoise Shell and various plain and mottled colors, in sheets, rods and tubes for use in the interior decoration and equipment of high class closed body jobs.

Write for samples and literature.

The Arlington Works

Owned and Operated by

E. I. du Pont de Nemours and Company

725 Broadway & 21 East 40th Street, New York

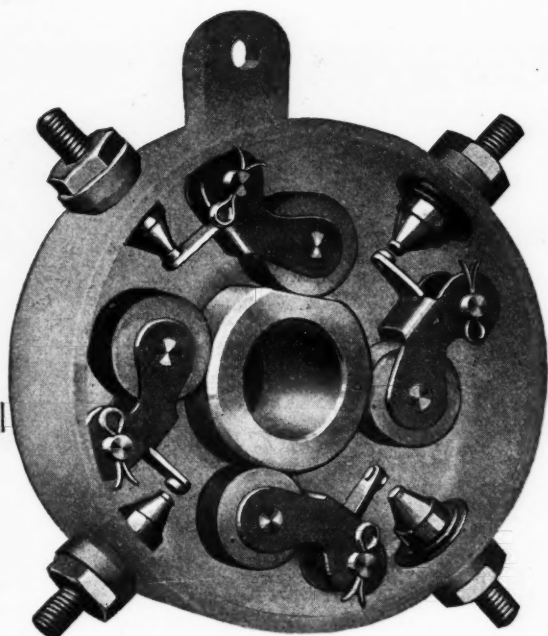
Canadian Offices, Toronto, Montreal, Winnipeg

The Principal DuPont Products Are

Explosives: Industrial, Agricultural and Sporting
Chemicals: Pyroxylin Solutions, Ethers, Bronzing Liquids, Coal Tar Distillates, Acids, Alums, Etc.
Leather Substitutes: Fabrikoid Upholstery, Raynite Top Material, Fairfield Rubber Cloth. **Pyroxylin Plastics:** Ivory, Shell and Transparent Py-ra-lin. Py-ra-lin Specialties, Challenge Cleanable Collars and Cuffs. **Paints and Varnishes:** For Industrial and Home Uses. **Pigments and Colors in Oil:** For Industrial Uses. **Lithopone:** For Industrial Uses. **Stains, Fillers, Lacquers and Enamels:** For Industrial and Home Uses. **Dyestuffs:** Coal Tar Dyestuffs and Intermediates.

For full information address
Advertising Division, E. I. du Pont de Nemours & Co.,
Wilmington, Delaware

DU PONT



DUNTLEY MAGNETO BREAK TIMER

FOR ALL FORD CARS
Eliminates Every Timer Trouble

The DUNTLEY Magneto Timer is the leader of all Timers for Ford cars.

Its design and construction are unapproached and mechanically it is as nearly perfect as any timer can be made. Its fiber rollers, in addition to their superior wearing qualities, eliminate the necessity for oil. They are a feature with which all timers should be equipped.

There are no sliding contacts to become insulated with oil; the positive, contact overcomes starting troubles; the tungsten points will not pit or burn; positive timing on all cylinders; interchangeable on regular Ford fittings. Tests show remarkable savings in fuel.

Only the finest materials are used in the construction of the DUNTLEY Magneto Timer. It is as high grade as any commutator used on the most expensive cars.

The DUNTLEY is going bigger and bigger with dealers all the time. It is fast proving its exceptional merits as the logical Timer for Ford Cars.

Twice the Power for Fordson Tractors

The following letter tells the experience of a Fordson Tractor owner, who uses a Duntley Magneto Break Timer.

"The timer you sent . . . is all you claim for it. It certainly gives the tractor twice the power it had before and also is a saver of fuel." Name on request.

SOLD ON AN ABSOLUTE MONEY BACK GUARANTEE

J. W. DUNTLEY

1004 Michigan Ave.

CHICAGO, U. S.

Jack Duntley,
1004 Michigan Ave., Chicago.

Dear Sir:

Kindly forward full particulars explaining the DUNTLEY Timer and also your Dealer's Selling Plan.

Name

Address



Boko
FOLDING STEEL CAMP CHAIRS

Folding Steel Camp Chair

**You Can Turn Your Investment
Over Quickly and With Big Profits**

Whenever an extra seat is needed, this strong, durable and comfortable stool is ideal. It is one of these handy little articles that cost practically nothing, yet pay for themselves in comfort and satisfaction every time they are used.

Dealers: Send for catalog No. 1100. This Boko Folding Steel Camp Stool sells quickly and insures big profits.



**THE BAILEY-
DRAKE CO., INC.**
1120 Michigan Ave.
Chicago, Ill.

Manufactured By
DEFIANCE WELDING CO.,
Defiance, Ohio



*The Mark that
Guarantees
Better
Quicker
Cleaner
Valve Grinding*

**S & P BRAND
Valve Grinding Compound**

increases speed, reduces time and makes a smoother, cleaner valve and seat surface than was ever thought possible. Has remarkable abrasive action. Does the job in less than half the time required by other compounds and costs less. Used by the largest New York Service Stations exclusively and this tells the story of its value.

**S & P BRAND
Valve Grinding Compound**

is entirely free from acids. Not adversely affected by climatic conditions. Furnished in 5 oz. Duplex cans at 40 cents per can. Also supplied in 1 lb. cans for factory use. Ask your jobber and insist on S & P Brand Valve Grinding Compound.

FREE TRIAL CAN!

Every repairman—dealer—garageman and service station man should at once send for free sample. Use it on your next job. Actual demonstration will prove what S & P Brand Valve Grinding Compound can do for you.

S & P Manufacturing Co.
163 Columbus Avenue New York

"LOCKS
WHERE LOCKS HOLD"



**Why lock the Stable
Door AFTER the
Horse Is Gone?**

—and why regret you didn't protect your Buick after it has been stolen. The sensible, safe and sure way is to protect yourself against loss by thieves by installing

**The POSITIVE
Transmission Lock
for BUICK Cars**

Locks the gears in neutral at the only place on the Buick car where the gears can be controlled. Takes the place of the dust cap on the ball and socket lever. Locks with a single turn of the key. Safe enough to reduce your insurance rates. Every Buick car deserves this protection.

Write for complete details

**Price
\$7.50**

**NORTH SIDE
BUICK SALES
COMPANY**

918-926
Sheridan Road
CHICAGO, ILL.



BUICK CENTER CONTROL LEVER
WITH POSITIVE TRANSMISSION LOCK

When Writing to Advertisers, Please Mention Motor Age



ALUMINITE
Connecting
Rods



Aluminite Pistons

ALUMINITE PISTONS

ALUMINITE Pistons are *more* than aluminum pistons. Strong enough to withstand all strains. Hard enough to give good bearing surfaces. Light enough to insure valuable fuel saving.

At overhauling time have ALUMINITE Pistons installed by your repairman. Cost you less in the long run.

DEALERS and REPAIRMEN profit by the ALUMINITE line.

ALUMINITE CONNECTING RODS

ALUMINITE Connecting Rods increase the efficiency of ALUMINITE Pistons. Give the motor greater power and speed. Decrease vibration and gasoline consumption. ALUMINITE Equipment is most efficient when complete.

GREEN POWER PLUS Cylinder Heads

Price \$25

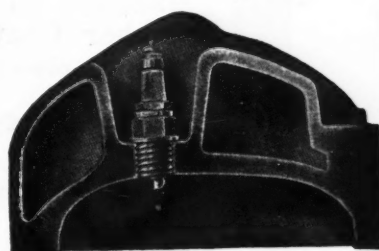
Sold on 30-Day Trial

Gives additional water space around the spark plug, gained by locating the plug directly over the center line of your cylinder. The result is additional power and pull for Ford PASSENGER CARS and TRUCKS.

WRITE

GREEN ENGINEERING CO.

34 South St. Clair Street, Dayton, Ohio



Green Power Plus Cylinder Head



UTCQ PRODUCTS

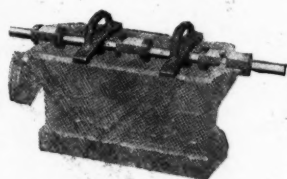
UNIVERSAL Main Bearing Replacement Equipment for

Ford Model "T" and FORDSON

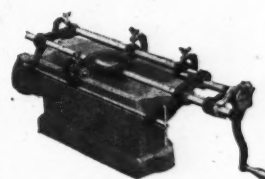
The finished bearings are accurate in diameter, thickness and alignment. Why depend on someone else to do this work? Hundreds of dealers and garage men are increasing their business by replacing bearings with these tools in their own shops.

Write us today for more information regarding this equipment.

See Current Issue Automobile Trade Directory for the list of jobbers carrying stock.



Babbitting Jig U. S. and
Foreign Patents Pending



Boring Bar. U. S. and
Foreign Patents Pending

THE UNIVERSAL TOOL COMPANY, INC., DETROIT, U. S. A.

Manufacturers of Universal Cylinder Reboring Tool and
Ford and Fordson Main Bearing Replacement Equipment

Guaranteed 10,000 Miles

At last—a fan belt of known and guaranteed performance. DEALERS—This is the safe belt to stock.

FLEX-O-TYTE FAN BELT

Combines Flexibility With Tightness.

Made for all cars. Built of special Rubber Coated Fabric, vulcanized into a one-piece belt—wrapped cure process.

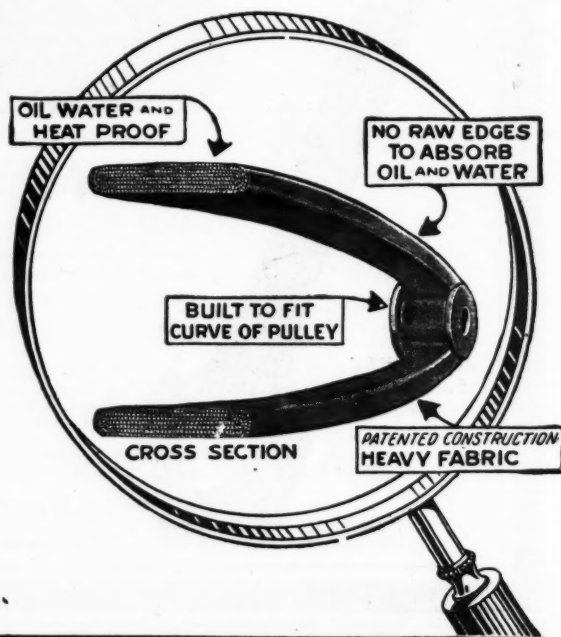
Dealers—Order Sample

The name of your supply house and 10c to cover postage and packing brings sample belt promptly. Our 32 page catalog FREE on request.

A. J. STEPHENS RUBBER CO.

1401 CHESTNUT STS.

KANSAS CITY, MO.

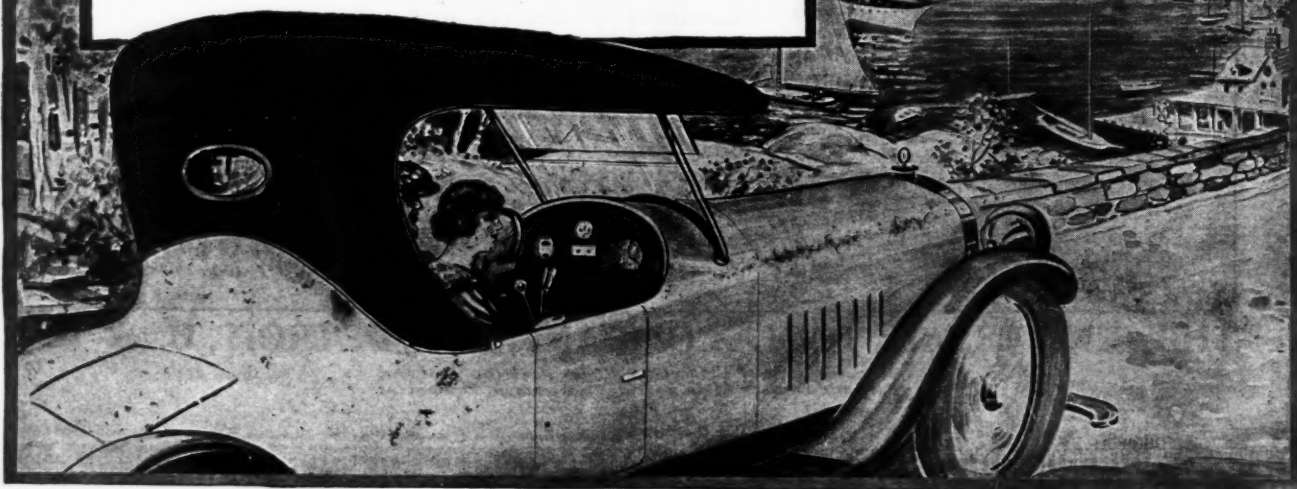
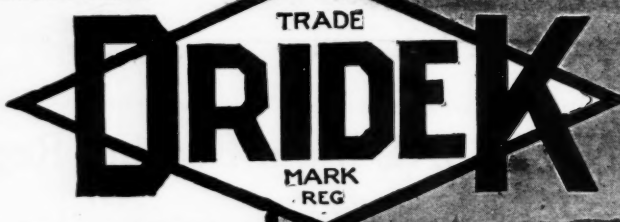


The Most Remarkable Automobile
Top Material

LIGHT IN WEIGHT—DEPEND-
ABLE IN QUALITY—NON CRACK-
ING—NON BLISTERING—Dridek
is Made to Satisfy.

Send to Dept. C for Samples and Prices

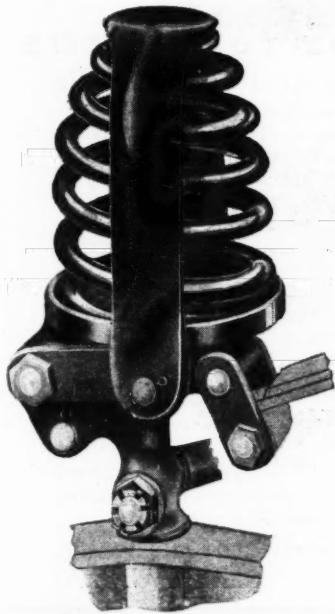
L. J. MUTTY COMPANY
BOSTON, MASS.



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HALLADAY

Direct Suspension Shock Absorber



The Halladay equipped Ford car floats over the worst roads, smoothly, evenly and comfortably. For the Halladay is the first shock absorber that has ever had the capacity to take the jolts and jars out of the light little Ford.

The car is directly suspended on four sensitive springs, reducing wear and tear, and greatly lowering gas and tire bills.

Learn what real comfort and economy in driving is. Install a set of Halladays.

Price per set. \$15.00

Write for full particulars today

L. P. HALLADAY COMPANY

*Manufacturers of Bumpers, Shock Absorbers and
Automobile Accessories*

520-530 Monroe Street

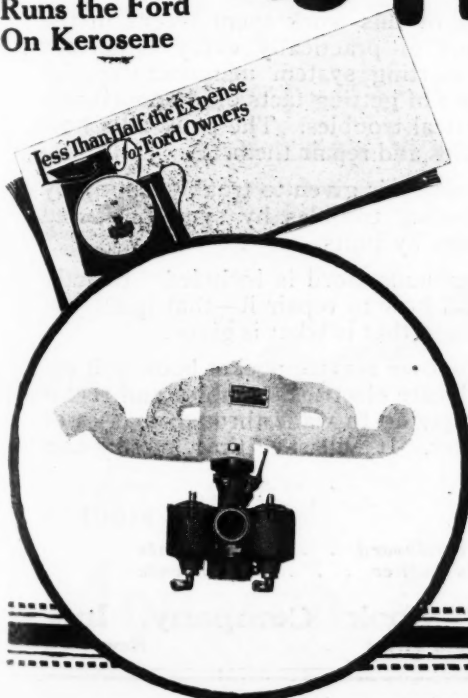
STREATOR

ILLINOIS

WESTERN

DUAL FUEL CARBURETOR

Runs the Ford
On Kerosene



Dealers Your Big Opportunity

Ever since the price of gasoline started to go up two or three years ago, every dealer knows that every car owner has been out looking for a logical, successful way to cut his fuel cost.

Dealers and owners now know that the only logical way to reduce fuel expense is to use a cheaper fuel—KEROSENE.

—and that the successful kerosene burning carburetor is the WESTERN.

Since the introduction of the WESTERN Carburetor, dealers have been pushed to the limit to meet the demand. Our

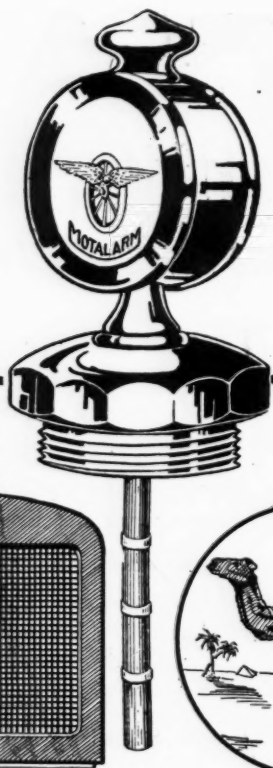
15-Day Trial Offer and Positive Guarantee

—make selling easy and profits big. One trial makes the sale on the basis of more miles at one-half the cost of gasoline.

Write for Free Illustrated Literature

Western Carburetor Co.

Alma, Mich.



A Camel Can Travel Without Water For a Week But a Motor Can't

The MOTALARM stands guard 24 hours a day over your radiator and cooling system. Through darkness, storms, heat or cold you will be warned with a loud, clear whistle when your radiator needs water; and until you refill the radiator you will get a persistent command from the MOTALARM for water.

MOTALARM automatically tells you when the water reaches the danger point and after the first signal you have sufficient water to travel 30 miles to safety. It is a steam siren operating only when the water gets below one inch from the bottom of the tank. You don't need to watch it.

If your dealer does not stock send \$3.00 and name of dealer direct for a MOTALARM.

Dealers—The enthusiasm of Motalarm owners make them easy to sell. Dealer display card and dealer helps will bring big business for you. Write today.

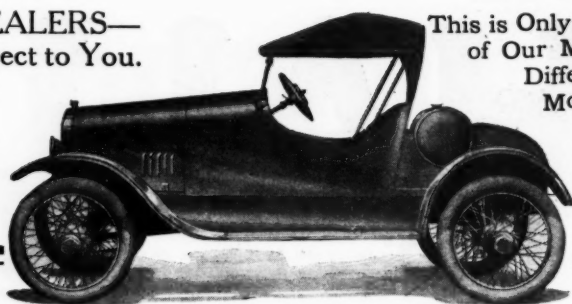
The Motalarm Corporation

Exclusive Licensee Under All J. G. Nolen Patents
Executive Office, 1777 Broadway New York City

MOTALARM

Signals When Water Is Low

**DEALERS—
Direct to You.**



This is Only One
of Our Many
Different
Models

UNIVERSAL SPORT BODY for FORDS

Meets the Demand—and Sells

The Universal Sport body for Fords offers everything a Ford owner demands when he buys a body—beautiful, graceful lines, giving the car an air of distinction—materials and workmanship of the best, assuring durability and long life.

Dealers who sell Universal Sport Bodies for Fords, sell luxury and comfort at lowest price, and at a profit that pays.

Latest style mohair one-man top, windshield and side curtains are regular equipment. Heavy gauge anti-rust steel—frame glued and screwed, **not nailed**—removable cushion seat—20 gallon gas tank—everything the very best help make Universal sales worth while.

Each body is painted **FREE** in any standard color. **It makes them buy.**

As manufacturers we make our proposition **direct to you**—and our sales plan showing **bigger profits**, is a winner. **Write for complete details.**

Universal Auto Products Co., Not Inc.
1434 S. Wabash Ave. Chicago, U. S. A.

Electric Starting & Lighting Troubles Boiled Down

The author of this work spent weeks in the service stations of practically every important lighting and starting system manufacturer, for the sole purpose of getting facts on diagnosis and repair of electrical troubles. The book tells how to locate troubles and repair them.

Special attention is given to trouble testing by elimination, finding troubles by symptoms, and locating troubles by units.

Not a superfluous word is included. Exactly how to find and how to repair it—that is all you want to know and that is what is given.

This boiled-down service pocket book will enable **YOU** to locate electrical troubles and repair them without having to wade through masses of irrelevant matter. It will save time, money and patience.

36 PAGES

26 FIGURES

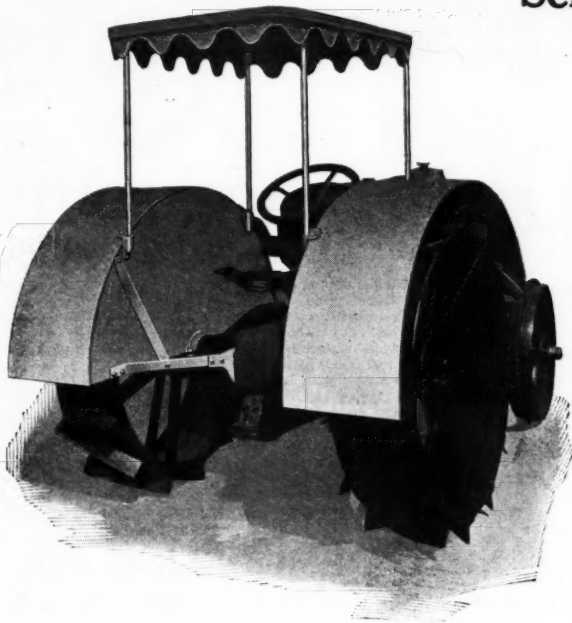
Heavy cardboard 50 cents
Flexible leather 75 cents

U. P. C. Book Company, Inc.
243-249 West 39th Street New York

FOR FORDSONS

WEISTEEL FENDER and CANOPY

Sells Readily to Fordson Owners



The Weisteel Equipment is heavier and more substantially built in every detail than any like equipment on the market. Requires no boring of holes to attach—only one-half hour required for installation.

Among Fordson owners there is an ever increasing demand for equipment of this kind. Every Fordson sold creates a new prospect. You will find the Weisteel a quick and profitable seller because of its superiority, its fine appearance, its rugged construction and ease of installation.

\$27.50 Complete
F. O. B. Atchinson, Kas.
\$22.75 Without Canopy

NOTE: Three sets of equipment in each crate.
 Packing charge of \$1.50 for broken crates.

DEALERS: Order from your Fordson distributor now. If he can't supply you, write us and tell us his name.

Immediate Deliveries

HENRY WEIS MFG. CO.

Atchison

Kansas

MONARCH RAPID FIRE GREASE GUN

**A Simpler Faster Gun—
 Strong and Easy Working**

The otherwise unpleasant task of greasing or oiling your car is made clean and easy by the Monarch. Simply constructed and remarkably easy of operation—the Monarch has won for itself a reputation as a quality product everywhere.

**Mail
 Your
 Order Today**



**List
 Price \$2.75**

**No twisting or turning
 Just Push Lightly**

The operation of the Monarch is similar to that of an automatic screw driver. The ratchets as illustrated do the work. A child can handle the gun so easy working is it. Low in price—backed by our guarantee of satisfaction or money back—the Monarch is worthy of a trial.

Monarch Auto Specialties

**513 S. Wells St.
 Chicago**

Scored Cylinders

HAVE THEM PUT IN SHAPE WITHOUT REGRINDING. Unless a cylinder is out of round or badly burned regrinding is not necessary nor advisable.

Send your scored cylinders to our nearest plant. There we will fuse into the scores our special silver-nickel alloy and finish it down to the cylinder wall surface—without altering the bore. This process (which takes but 24 hours in any of our plants) costs about one-fifth the price of regrinding, makes a job good for life and eliminates new piston and ring buying.

Here's a brand of service that makes, holds and increases trade—and it is also a profit builder in a big way.

We also specialize in the repairing of cracked water jackets, using a modification of our patented process. This service is rendered on the same high quality basis as that characterizing our cylinder repairing.

A few territories open. Write for information.

L. LAWRENCE & CO. 2026 Woolworth Bldg.
New York

Established 1862

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Cleveland, 6259 Euclid Ave.
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Kansas City, Kan., General Auto Parts Co., Grand Ave.
Lima, Ohio, Buckeye Repair Shop, 133 Water St.
Memphis, J. B. Cook Machine Shop, 294 Washington St.
Providence, R. I., Liberty Manufacturing Co., 15 Pine St.

A FEW TERRITORIES STILL OPEN FOR LICENSEES

LAWRENCE
PATENT
PROCESS
SCORED CYLINDERS AND SAND-FAULTS CORRECTED
TRADE MARK
BORE PRECISION MAINTAINED
CYLINDER SCRAPPING ABOLISHED



REMO RACEABOUT BODY FOR FORDS

Beauty and durability are what buyers look for in a body for Fords—and that's just why the Remo has made such a big hit. It leaves nothing to be wanted by the Ford owner.

Model SS is the very latest in design and is built for long hard service. It is extremely easy to attach—there are no disappointments for the buyer.

DEALERS—Some good territory still open. This is a product that will make big money for every aggressive dealer.

The big feature of REMO Model "SS" is the mounting. All red tape in attaching to the chassis is done away with. No change in dash. No block needed for lowering steering post. Everything complete and ready to slip on like a regular Ford body.

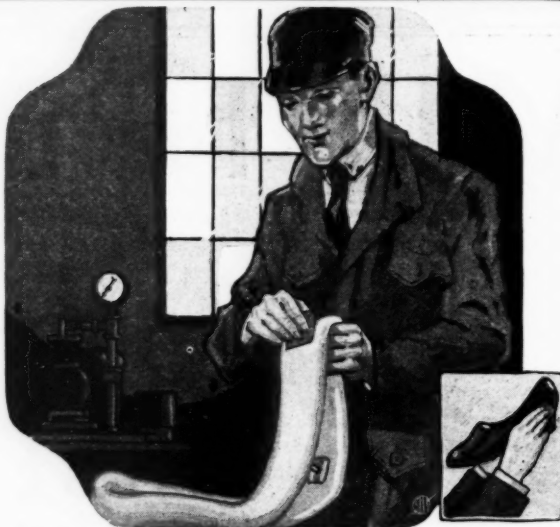
Windshield is ventilating and adjustable. Top is military style—made of mohair complete with side curtains.

Write for sales proposition

AUTO REMODELING CO.

1501 Michigan Ave.

Chicago, U. S. A.



Patented
50c, \$1.00, \$1.50



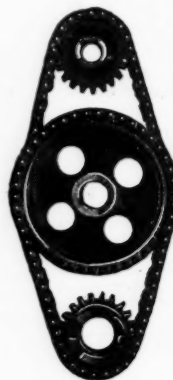
TAKES only 3 minutes to apply Wood's Everloc, the original, self-vulcanizing Tire Patch. Heat vulcanizing often takes 30, and may burn or over-cure tube. Use Wood's Everloc. Safe, simple, quick! Keeps leaks permanently air tight. Repairs all rubber goods. Guaranteed to mend blowouts or punctures up to 17 inches. 3 sizes: 50c, \$1.00, \$1.50.

DEALERS:—Get our proposition from jobbers or us.

W. C. WOOD COMPANY

74 Western Avenue, Dept. B, Minneapolis, Minn.
SPECIAL GARAGE SIZE: 20" x 28"

WOOD'S EVERLOC
TIRE PATCH



WAR RECORD NOT MADE PUBLIC

The "Whitney" Special Quality "Type M" Chains

Made a great showing during the war years 1916-1917 and 1918.

Our tests and demonstrations were made on prominent 8-cylinder motors in service on a large number of cars owned in the State of Connecticut.

During this long period not a single "Whitney" Chain or Sprocket had to be replaced and the condition of every Drive has been pronounced remarkable.

One Drive recently examined had given over 35,000 miles' service and both Chains and Sprockets were in such perfect condition that they appeared good for more than double that record (Sprockets having no adjustment).

The links of this SPECIAL CHAIN have finished faces and reamed holes, and the smooth faces do not damage the Sprocket teeth.

Our war contracts were such that we did not announce this SPECIAL CHAIN until after the conflict was over.

THE WHITNEY MFG. CO.

HARTFORD, CONNECTICUT

WIRE WHEELS

HOOK

We can supply immediately, sets of Houk Wire Wheels for all the cars listed and any of the service stations below will gladly install them.

Dealers should send at once for the particulars of our service and sales agency proposition.

Buick	Franklin	Oldsmobile
Cadillac	Haynes	Overland
Chalmers	Hudson	Raige
Chandler	Hupp	Scripps-Booth
Chevrolet	Kissel	Studebaker
Cole	Lexington	Stutz
Dodge	Marmion	Velie
Dort	Maxwell	Westcott
Essex	Nash	Winton

HOUSE

Set of 5 House Wire Wheels, 4 inner hubs, 4 hub caps, hub cap wrench, spoke nipple wrench, one hub dust cover for spare wheel. White, Black, Red; color optional. For Fords, \$65.
For Chevrolet 490 and Overland Model 4, \$75.

WIRE WHEEL CORPORATION
OF AMERICA

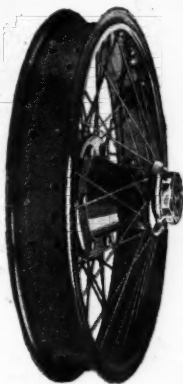
(Successors to Houk Manufacturing Co.)

1700 Elmwood Ave. Buffalo, N. Y.

Direct Factory Branches and Service Stations:

New York, 835 11th Ave. at 57th St.	Detroit, 16 Davenport St.
Philadelphia, 328 N. Broad St.	Los Angeles, 1216 S. Grand Ave.
Chicago, 23rd St. and Indiana Ave.	San Francisco, 1690 Pine St.

Exclusive Canadian Representatives:
Dunlop Tire & Rubber Goods Co., Toronto

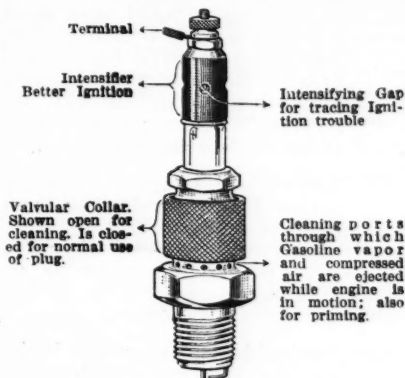


A Revolution in the Spark Plug Field

WONDER

Self-Cleaning Spark Plug

"The Plug That Cleans Itself"



The main features of the WONDER are: Rugged construction, finish, material and workmanship unsurpassed; convenience in cleaning, priming and locating of ignition trouble; gasoline saving, and prevention of carbon accumulation in cylinders.

How WONDER cleans itself: Turning the valvular collar up opens the ports and releases compression to such an extent that ignition ceases. The compression forces gasoline mixture through plug, cuts the carbon, and blows same out through ports.

DEALERS AND JOBBERS: This is the fastest selling plug on the market today. Its superiority and advantages over all competitors are so obvious to consumer when he sees it as to make it absolutely irresistible to him.

NOTE: Novel features of plug assure your salesman an audience and business.

Very Liberal Discounts—ORDER TODAY

B. and C. ORGANIZING CO. KANSAS CITY MISSOURI

Note the strong Detachable Clamping Head

\$3.00

Safety Made
Secure

"J. C. M."

Radius Rod for Fords

Made of 11 gauge, seamless tubing

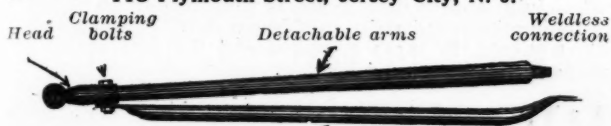
Because of the weldless non-brazed joint this rod overcomes the constant menace of accident from the breaking of the brazed or welded joints of the ordinary radius rod. Readily applied to any Ford car at low cost.

The J. C. M. Auxiliary Brace shown below prevents steering wheel oscillation. Makes the control of Ford car or truck simpler and safer. Quickly attached in combination with J. C. M. Radius Rod.

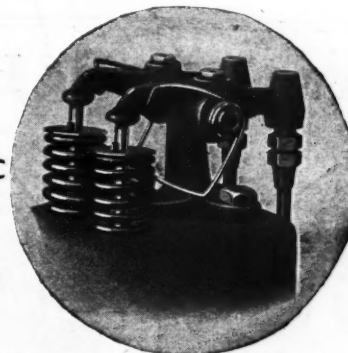
Easy and profitable sellers for the trade. Write for Terms.

JERSEY CITY MACHINE CO.

115 Plymouth Street, Jersey City, N. J.



The J. C. M. Auxiliary Brace, \$1.00



STOP THAT NOISE

caused by push rod and rocker arm action in

Valve-in-head Motors

KHK Motor Silencers are guaranteed in writing to eliminate from 75% to 90% of that continuous metallic knock in valve-in-head motors.

KHK
Valve in Head
MOTOR SILENCERS

take up the play in the push-rods and rocker arms and hold the cam rollers in close contact with the cam shaft. A simple, durable attachment that produces marvellous results. Endorsed by automotive engineers as a practical addition to valve-in-head motors. Satisfaction guaranteed or money refunded. Guaranteed against breakage. Easily attached by the car owner.

Set of 6 for six-cylinder cars.....\$3.00
Set of 4 for four-cylinder cars.....\$2.25

Dealers—Read This

KHK Motor Silencers are in great demand. They sell on sight. It will pay you to write for details of our liberal dealers proposition. We help our dealers sell.

Kay H. Kay Company, 969 Woodward Ave., Detroit



There's a Growing Demand For This Strong—Sturdy James Pump

You have found it good business policy to build your good will on **quality** accessories. You will find it good policy to sell James Pumps because this pump gives the day in and day out service that enhances your reputation with your customers.

There's one James feature—the patented positive check valve—that sets it above all other pumps in your stock. The valve is so simple that it can be re-ground and replaced in perfect condition by the owner.

Stock this James pump. Write for literature and discounts.

Generator Valve Company
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47 Dinsmore Pl., Brooklyn, N. Y.

JAMES TIRE PUMP

What Garagemen Think About "TRIPLEXD"

Extrac
No. 20



Powell Garage
Company
Bedford Ave. and
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Brooklyn, N. Y.

Flexibility and Wear

(Further testimony)

"DURING the time that we have been using your hose we have noticed that although the hose is strongly constructed to withstand hard usage, it is, nevertheless, very pliable . . ."

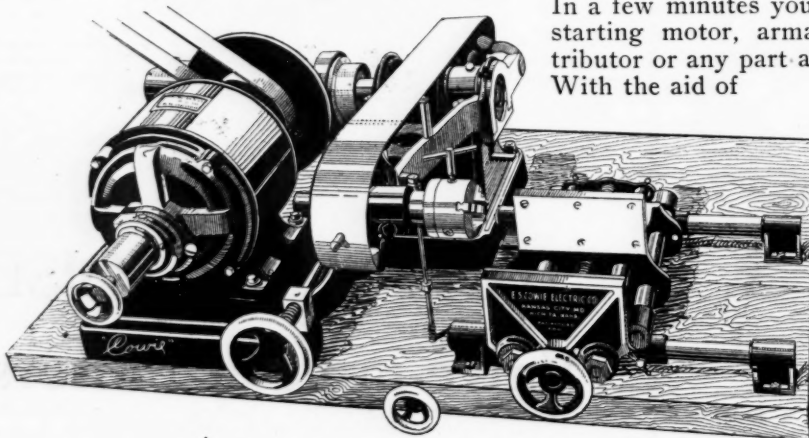
"We have found that hose which is flexible stands up better under chafing from the walls of the gasoline hose than hose that is stiff, and also does not crack when kept in bent position."

Watch for What Garagemen Think from Week to Week

TRIPLEXD

METAL HOSE & TUBING CO.
INCORPORATED
135 Tillary St
BROOKLYN, N. Y.

Eliminate Guessing In Electrical Testing and Repairing



In a few minutes you can test with absolute accuracy any starting motor, armature, magneto, coil, generator, distributor or any part about automotive electrical equipment. With the aid of

THE COWIE TESTING EQUIPMENT

you can ascertain what is wrong—surely and quickly—whether repairs are possible or whether it will be necessary to make replacement.

20 years' practical experience in the electrical business, during which time over 50,000 customers have been served annually in Cowie Service Stations, is the foundation for the development of the Cowie Testing Equipment.

SAVES TIME

SAVES MONEY

You will find a very interesting article on page 1 of Motor Age, March 20.

You can't make a better investment. The Cowie Testing Equipment should pay for itself first year. Don't figure if you can afford the Cowie Testing Equipment; figure if you can afford to be without it.

WRITE TODAY FOR CATALOGUE. Our new catalogue is very complete and comprises one encyclopedia of facts and information which no repair man or garage man should be without. It describes fully and in detail with reference both to the complete bench and the various combinations and units used separately, by simply written text and many graphic illustrations, the most complete and the first absolutely universal testing equipment that has been placed on the market.

E. S. COWIE ELECTRIC CO.

Kansas City, Mo.
Wichita, Kansas

**\$... to the Machine Shop?
... to the Junk Man?
... to your Cash Register?**

Don't junk or send that next crank shaft job to a machine shop. When crank pins are pounded out of round, don't waste time trying to scrape bearings to them. Flat pins are easily and quickly rounded, allowing for perfect adjustment, with an

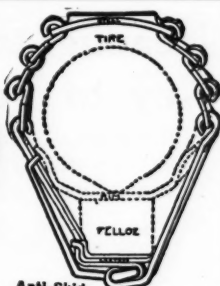
Atlas Abrasive Tool

A hand tool designed for use in your own shop. The most simple, inexpensive, satisfactory and profitable way of handling crank shaft jobs. Price of tool complete \$10 by parcel post. Extra cutter (good for truing up from 10 to 20 pins) 30c each, post paid. Capacity 1 1/4 to 2 3/4 inches diameter.

ATLAS MFG. COMPANY,
720 N. Canal St., N.S., Pittsburgh, Pa.



Steel Tires & Mud Chains



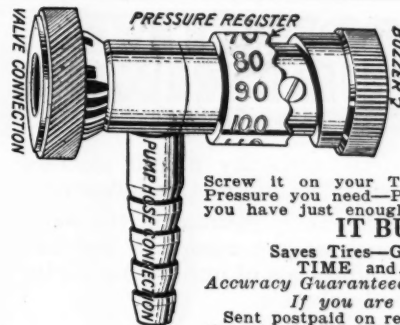
Old Tires
Covered
Complete

Try 2 or 3 sections over any old blowout. Can't have blowouts, punctures; neither can the rubber wear off.

Special prices to those in new territory

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Anti-Skid
Mud chains can be put on in a jiffy with one hand while standing on the running board. Hook the ends together and push the little lever. If you get in a mud hole you will laugh out loud.



**IT CRIES
QUIT THE
BUZZING
WIND
JAMMER**

Screw it on your Tire Valve—set at the Pressure you need—Pump away—and when you have just enough air in the Tire

IT BUZZES

Saves Tires—Gasoline—Repairs
TIME and PATIENCE
Accuracy Guaranteed—Money Refunded—
If you are not satisfied
Sent postpaid on receipt of \$1.00. Descriptive Circular mailed on request.

Hartley Screw Company

Dept. F—132 Central Avenue

P. O. Box 405

NEWARK, N. J.

Special Drop Forgings
made from your specifications



Besides our work of making standardized body parts, we do special drop forging.

We will not accept business beyond our capacity; this and the fact that we have on hand large stocks of standard carbons argues for prompt delivery.

Forgings are made of standard open hearth soft steel or to special carbon and alloy specifications.

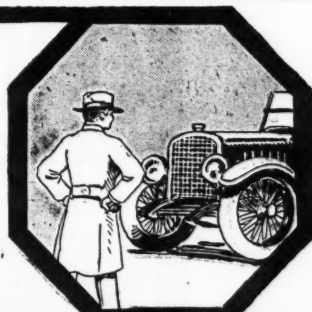
Assemblers who demand careful forging work will be interested in our proposition.

Write for catalog.

THE BREWER-TITCHENER CORP.
Cortland, N. Y.

NON-FLUID OIL

PROLONGS life
of your car—it
cushions gears and
protects bearings.



"KOO" For Bearings "KOO Special" For Gears
in orange cans at all dealers

New York & New Jersey Lubricant Co. 165 Broadway New York

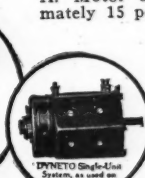
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**STARTING
LIGHTING
SYSTEMS**

THE DYNETO shows greatest efficiency in both motor and generator. Type D. A. Motor develops a torque of approximately 15 pounds. Type C. A. Generator shows approximately 15 amperes. A car-speed of 15 to 20 M. P. H. keeps batteries fully charged. Starter always sure to start. Lamps always bright. Send drawings and specifications for our recommendation.

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BURD
High Compression
PISTON RINGS

"The Accepted Standard"

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ROCKFORD, ILLINOIS
Sales Offices in All Principal Cities.

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SCIENTIFIC IGNITION



for
Passenger Car
Tractor
Truck
Motor Boat



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One to Five Ton Models. Write for full information.

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Trucks

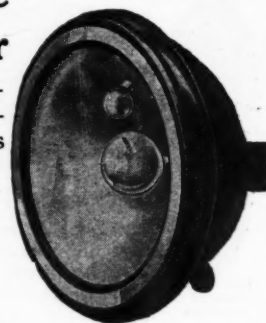
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Johnson Automobile Lock

A real *thief* proof lock that fully protects unattended cars.

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Are the Product of the World's Largest Organization Devoted to the Building of Truck and Tractor Motors Exclusively.

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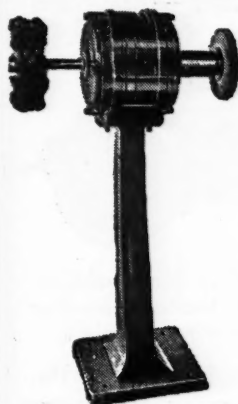
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Fisher Rim Grip Sub Casings give from 2,000 to 4,000 extra miles from tires, hold all the pressure of inflated tube, completely reinforce all parts of tire, prevent blowouts. Made of piles of finest grade rubberized fabric with pure rubber outside layer.

Dealers: Liberal Discounts make it worth your while selling them. Write us today.

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COMPANY**
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THE **Fisher**
RIM-GRIP SUB-CASING



Dealers! Garage Men! Repair Men!

Investigate the Le Bron Buffer and Power Plant. Air outfit connected if desired. 2, 3 and 5 H. P., any voltage; dust-proof and ball bearing motor.

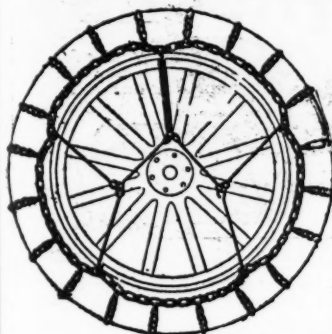
USERS: This outfit will pay for itself immediately

Dealers: Get our liberal proposition

Write for prices and information

Le Bron Electrical Works
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MERCHANT'S ANTI-SKID CHAIN TIGHTENER



Do away with that slapping and banging of chains against the fenders. Put a stop to dragging and rattling.

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For Automobiles
\$1.00 each

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80 watts, 8 volts, 10 amperes \$48.50
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120 watts, 110 volts, 10 amperes \$68.50
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All outlets complete with switch-board as cut shown.



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1/2 H. P. INDUCTION MOTOR
110 or 220 volts, A. C., 60 cycle, single phase, 1750 R. P. M. \$32.50

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Suitable for operating Small Compressors, Coffee Grinders, Bottle Washers, Lathe, Drill Presses, etc.

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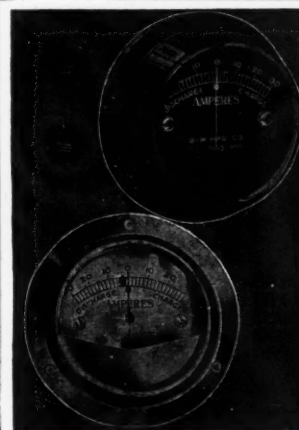
Portable Electric Drills
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These devices have exclusive advantages of design and construction.

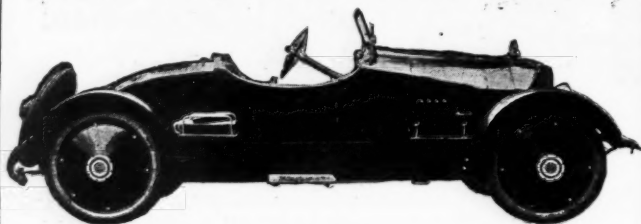
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An Ammeter must register accurately at ALL times in order to fulfill the purpose of its installation. Furthermore, it is essential to appearance that the instrument conform to the finish and type of car in which it is installed, enhancing rather than detracting from its looks. B-W personifies perfection in Ammeters. Accurate always. Made in styles to conform to any design or finish. A product of beauty as well as utility. Why install inferior Ammeters when the cost of the best is but little more. **WRITE FOR LITERATURE**

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 A Complete Line of
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DON'T TAKE CHANCES
by using untested, cheap Battery Separators. Poor Separators cause good batteries to go wrong, and the difference in cost between ordinary Separators and our **GUARANTEED Chemically Treated Separators**, is very small.

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and remember that our Separators are
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EVERY INCH WORTHY THE NAME

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Equipped with the

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These axles have stood up in actual service for eight years. The entire weight of the load is on the front and rear axles and springs, thus allowing the differential and propeller shaft to operate without weight or strain.

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A size for every business

INCOMPARABLE engine ability, axles, springs, brakes and frame of the best material, and above all, unexcelled workmanship, characterize KISSEL TRUCKS.

See your nearest Kissel Dealer today

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A SELF-VULCANIZING PRODUCT FOR REPAIRING TUBES AND TIRES. No Heat or Tools required to complete a permanent and everlasting repair.

Motorists are convinced upon the first trial that Perfectfix is their greatest necessity at all times.

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WIRE WHEELS

 Every Pasco wheel is perfectly balanced and absolutely true. These *nut proof* wheels are of standard tread—interchangeable with wooden wheels. The spokes will not interfere with any valve stem.

Pasco wheels have indestructible metal hubs, strong web spoke lacing and are locked to axle with double lock nuts. Write for dealer proposition.

 NATIONAL WIRE WHEEL WORKS, Inc.
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Winton Six

Of all plus-powered motor cars, the Winton Six is known to be easiest on tires. This is due to its freedom from surplus weight and its accurate balance.

Write today for catalog

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424 Berea Road, Cleveland, Ohio, U. S. A.

THE PACO DESIGN EXCELS



THE NEW 1919 PACO BODIES are nifty and snappy. Mount a PACO on any Ford chassis and you will drive the classiest speedster on the road. PACO BODIES are modeled after world famous racing cars. They have real leg room—are comfortable and easy riding.

ORIGINAL and PATENTED Models PACO Bodies are exclusive. The designs are covered by U. S. Patents. When you drive a PACO it is the only genuine racing roadster body of its type. Built in different styles and models—with Paco Exhaust Pipe—Disk Wheels and other features. **FREE CIRCULAR**—Write today for illustrated literature from actual photographs of PACO BODIES. Get prices and complete description.

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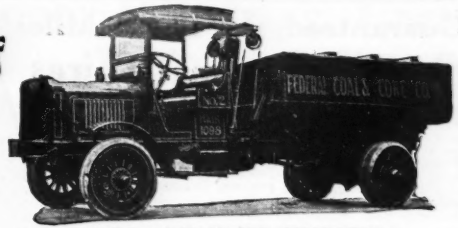


Standard

1, 2, 3½,

5 Ton

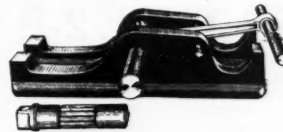
Worm Drive



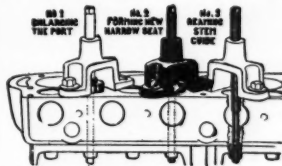
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The men behind STANDARD manufacture combine their broad knowledge of heavy haulage problems with the best units and materials possible to buy, making the STANDARD a thoroughly reliable truck—a truck which does not require constant service. Dealers write.

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BENDIX DRIVE

for electric starters

AUTOMATIC ENGAGING AND DISENGAGING

Used by

170 motor car and truck builders



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ELMIRA, N.Y.



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Free From Oil means fewer punctures, increased mileage and less repairs.

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the system that ignites the gas at two opposed points at once? This burns the mixture completely and almost instantly; increases power and gasoline mileage; saves fuel and lessens carbon accumulation and spark manipulation. SU-DIG Series Spark Plugs added to the plugs now in your engine give Two Plug Ignition.

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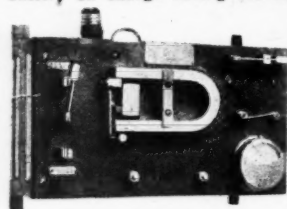
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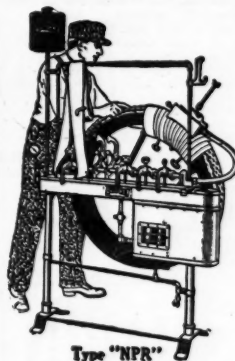
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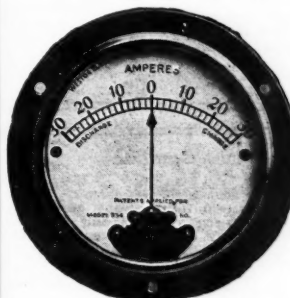
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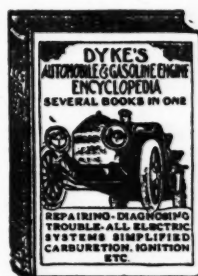
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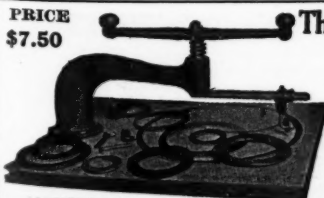
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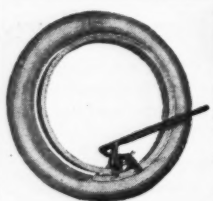


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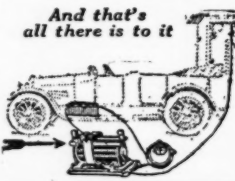
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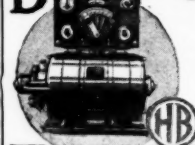
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Commerce TRUCKS

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1-1½ and 1½-2 Ton CAPACITIES

FULLY EQUIPPED

with starter, electric lights, windshield and bumper.

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A Fine Line of Touring Car Models
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Offers an almost unlimited opportunity for dealers

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Built for Motor Service at Motor Speeds. INCREASE your Trucking capacity at less cost. With a Watson Trailer and Watson Tractor you have all that a truck can give you and a lot it can't.

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It dissolves the worst grime and grease; doesn't scrape; and leaves the hands soft and healthy.

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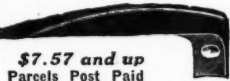
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THE ORIGINAL VISIBLE SPARK PLUG



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1 Continental with starter	125.00
1 Rutenber 6 out of Auburn	125.00
1 Reo 6 cyl.	125.00
50 New Sun 6 cyl.	125.00
2 Mitchell T Head 6 cyl.	125.00
2 Alco 6 1/2 Ton Truck	150.00
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Hair and Leather in
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1 National 4 cyl.	125.00
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Silent Starter and Generator Coils;	
all lengths and sizes.	

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Autolite, Overland 79, 81, 83	15.00-20.00
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Remy 182	20.00
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SECOND-HAND CAR DEPT.

\$150.00 to \$550.00
50 to 75 exceptionally good used cars at prices so low that they would even interest dealers.

SPEEDOMETER HEADS

Stewart or Warner \$1.50 to \$4.00

RIMS

All Styles and Makes \$2.00 Up

**DEPOSIT REQUIRED
WITH
ALL ORDERS**

SPECIAL BARGAINS

In New Parts and Material

New Autolite Ammeters, 20 amp.	\$ 1.50
New Autolite Ammeters, 30 amp.	2.00
New One-Man Top Wind shields	8.00
Connecticut 3-button switches	1.75
National Standard Medium Jacks	1.50
Heavy Grease Guns	.50
50 New Adjustable T Bumpers, Nickel or Black, fit all cars except Fords, each	4.50
14,000 ft. new radiator hose. Price per ft., 1-in., 15c; 1 1/4-in., 17 1/2c; 1 1/2-in., 20c; 1 3/4-in., 22c; 2-in., 25c; 2 1/4-in., 27 1/2c; 2 1/2-in., 30c; 2 3/4-in., 32 1/2c.	

NEW LAMPS

11 inch single bulb	\$6.00
10 inch single bulb	5.00
Electric tail-lights	.85
Electric side lights, pair	1.75

NEW BRAKE LINING

Price per foot	
1 1/4-in., 20c	1 1/4-in., 25c
1 1/4-in., 30c	2-in., 30c

FLEXIBLE TUBING

Price per foot	
1 1/4-in., 25c	1 1/4-in., 30c
1 1/4-in., 35c	2-in., 40c
2 1/4-in., 45c	2 1/2-in., 50c

NEW & USED GEARS & BEARINGS

New Bailey Differentials for Overland Models, 80, 81, 83..\$10.00

Prest-O-Lite Tanks

Model B.....\$4.00 each; E.....\$3.00 each

Searchlight Tanks.....\$2.00

NEW WIRE WHEELS FOR FORDS

Set of 4 wheels and 5 rims, \$45.00. \$5.00 allowance for old wheels. Demountable Rims for your Ford Wheels 30x3 1/2—Set of 5 with 4 filler bands \$6.50.

New parts for 13-14-15 Velle and Stoddard-Dayton Cars.

NEW TIRES

5000 Mile Guarantee

Size	Ribbed Tread	Non-Skid	Size	Ribbed Tread	Non-Skid
31x3 1/2		\$12.50	34x4	\$21.00	\$22.50
32x3 1/2	\$15.00	16.00	33x4 1/2	21.00	22.50
31x4		20.00	34x4 1/2	25.00	27.50
32x4	17.50	18.50	35x4 1/2	27.50	30.00
33x4	20.00	21.00	35x5	30.00	32.50
			37x5	32.50	35.00

10% Deposit Required with each tire ordered
Balance C. O. D. subject to examination

30x3	\$1.75	34x4	\$3.00
30x3 1/2	2.00	36x4	3.50
32x3 1/2	2.25	35x4 1/2	3.25
32x4	2.50	36x4 1/2	3.50
33x4	3.00	37x4 1/2	3.75

NEW RELINERS

GOOD USED TIRES & TUBES OBTAINED FROM WRECKED CARS

WRITE FOR PRICES

New Solid Tires at exceptionally low prices.

**MAIL ORDERS SHIPPED SAME DAY
HIGHEST PRICES PAID FOR WRECKED CARS**

WARSHAWSKY & CO.

LARGEST CAR WRECKERS IN THE WORLD

1915 SOUTH STATE STREET PHONE CALUMET 7315 CHICAGO, U. S. A.

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Get It When You Want It

A Million Parts a Year Pass Through Our Great Shops—Immense Variety Always on Hand. Bargains

A Partial List of Big Savings In Stock NOW!

MOTORS	
E. M. F. 30.....	\$ 50.00
Landers 20.....	40.00
Studebaker 6-13.....	75.00
Studebaker 4-17.....	100.00
Studebaker 6-17 with Starter and Generator.....	175.00
Stoddard Dayton 30.....	60.00
Stoddard Dayton Savoy.....	75.00
Stoddard Dayton 45.....	75.00
Marion 1912.....	75.00
Kissell 1912.....	75.00
Stafford.....	75.00
Moon 1913.....	75.00
Interstate.....	75.00
Case 1914.....	75.00
Overland 56.....	50.00
Overland 69.....	50.00
Overland 81.....	75.00
Chalmers 26-B 6 1915.....	100.00
Packard 6-38.....	175.00
Mitchell 6-17.....	100.00

UNIT PLANTS	
Paige 6-16.....	\$175.00
Nyberg 6.....	75.00
Crow-Ekhart, Locoming.....	75.00
D. U. X.....	125.00
Chalmers Model 17.....	75.00
Elgin 6 Falls Motor.....	125.00

Hudson 6-54.....	125.00
Chandler 6-1915.....	150.00
Perkins 8-cyl. with Starter & Generator.....	150.00
Wisconsin C U 3 3/4x5 Starter & Generator.....	125.00
Pathfinder 12-cyl. Starter & Generator.....	400.00
Continental 7 n 1917 Starter & Generator.....	250.00

STARTERS	
Auto Lite Patterson.....	\$ 5.00
Auto Lite Abbott Detroit.....	15.00
Auto Lite Overland 81.....	12.50
Auto Lite Overland 83.....	12.50
Auto Lite Overland 75.....	12.50
Westinghouse Frame 300.....	20.00
Wagner Model 154.....	15.00
Wagner Model 168.....	20.00
Gray & Davis Type Y Metz.....	10.00
Gray & Davis Type Y.....	10.00
Gray & Davis Paige 4-36.....	15.00
Ward Leonard Moline.....	10.00
Remy Model 182.....	15.00
Remy Model 4 Reo 1914.....	15.00
Simms Huff Starter & Generator.....	20.00
Leece Neville Haynes.....	20.00

GENERATORS	
Leece Neville 6 volts.....	\$ 15.00
Leece Neville 12 volts.....	20.00
Ward Leonard.....	15.00
Auto Lite Model GB.....	15.00
Auto Lite Model GC.....	17.50
Auto Lite Model CG.....	15.00
Gray & Davis Type T.....	12.50
Apico Mod. A 25 12-volt.....	15.00
Apico Mod. A 25 6- and 12-volt.....	15.00
Westinghouse 201.....	20.00
Westinghouse Gen. & Distr. S A 76 6 cyl.....	17.50
Remy Model 16.....	15.00
Remy Gen. & Distr. Model O B.....	25.00
Deaco Gen. Model U F 8-volt.....	17.50

RELINERS	
New Stock	
28x3.....	\$0.75
30x3.....	1.00
30x3 1/2.....	1.50
32x3 1/2.....	1.50
34x4 and larger.....	2.00
BLOW OUT PATCHES	
New Stock	
3-3 1/2-4 in., each.....	\$0.25
Dozen Lots.....	2.25

INNER TUBES	
New Stock	
34x4.....	\$2.50
VULCANIZING CEMENT	
1-pt. Cans.....	50c
1-qt. Cans.....	75c
PATCHING OUTFIT	
Patching Rubber & Cement	
3 sizes in Cartons	
Regular Price.....	50c, 75c, \$1.00
OUR Price.....	25c, 50c, 75c
RADIATOR HOSE	
Pieces 1 1/2x12 in.....	15c
MAGNETOS	
Dixie.....	\$ 15.00
Simms.....	15.00
Bosch NU4.....	15.00
Bosch D4.....	17.50
Bosch DR4.....	25.00
Bosch D14.....	30.00
Bosch ZR4.....	40.00
Bosch ZR4 2-spark.....	100.00
Bosch DR4 2-spark.....	60.00
Bosch D6.....	25.00
Bosch DR6.....	35.00
Bosch D16.....	35.00
Bosch ZR6.....	50.00

IRON CLAD GUARANTEE: Absolute Satisfaction or Money Immediately Refunded. No Quibbling on Our Part
The Original "We Tear 'Em Up and Sell the Pieces"

AUTO WRECKING COMPANY

13th and Oak Streets

Kansas City, Mo.

PARTS FOR ALL CARS

We Save You 50 to 80% of the Original Cost

SATISFACTION OR YOUR MONEY BACK

New Spotlights, 5" lens with mirror.....\$3.48

Prest-O-Lite Tanks

Model B.....\$4.00 ea.
Model E.....3.00 ea.
Searchlight Tanks. 2.00 ea.

COILS

Bosch Type A.....\$6.50
Bosmann.....3.50
Splidort.....3.50

STARTERS

Gray & Davis.....\$14.00
Auto Lite, Bendix Drive.....17.50
Jones Starter and Generator.....20.00

GENERATORS

Gray & Davis.....\$14.00
Remy.....12.00
Vesta.....10.00
Silent Starter and Generator.....
Chains, all lengths and sizes.
Lighting and Starting Patteries.....\$6.00 to \$15.00
Rims.....1.50 to 3.50
Carburetors.....3.50 to 7.50

5% Off for Cash in Full with Order.
Deposit Required with All Orders.
Get Our Prices on New Tires.

MAGNETOS

New

Bosch ZR6.....	\$40.00
Bosch ZR4.....	35.00
Bosch DU6.....	32.00
Eisemann G4.....	27.50

Magnetos

Bosch DU4 Variable.....	24.50
Bosch DU4 Set Spark.....	\$20.00
Bosch DU6.....	27.50
Bosch DB4.....	18.50
Bosch DR6.....	20.00

Overh'd & Guaranteed

Bosch ZR6.....	35.00
Bosch D4.....	\$14.00
Bosch D6.....	15.00
Eisemann.....	12.00
Remy.....	6.00
Dixie.....	11.00

NEW GEARS FOR ALL CARS

REBUILT BATTERIES

Guaranteed for 6 Months
6 Volt Starting and Lighting Batteries.....\$13.50
12 Volt Starting and Lighting Batteries.....18.50

MOTORS

In Excellent Condition

Continental, Model E.....\$75.00
E. M. F. 30.....60.00
4 cyl. Studebaker 25.....50.00
4 cyl. Everett 30.....45.00
4 cyl. Davis 30.....50.00
Overland 69.....60.00
Overland 83 with starter and generator.....\$100.00

UNIT POWER PLANTS

Continental, Model E.....\$115.00
Chalmers 30.....65.00
Radiators.....\$10.00 and up
Speedometer Heads.....\$1.00 to \$3.00
Axle Shafts.....\$2.50 to \$7.50
Front Axles.....Springs
Rear Axles.....Transmission Gears
Transmissions.....Differential Gears
Toller Ball Bearings (All Makes).....\$1.00 to \$3.50. Pistons, Cylinder Blocks, Crank and Camshafts, etc.

Full Cash Refunds, less Express Charges, Allowed on Returned Goods.
Prompt Attention to Your Orders.

OUR SLIGHTLY USED Tires and Tubes

OBTAINED from WRECKED CARS
Mean Economy to You—A Trial Will Convince You

Size	Tires	Tubes
30x3.....	\$ 4.50	\$1.35
30x3 1/2.....	5.50	1.45
31x3 1/2.....	5.75	1.50
32x3 1/2.....	6.00	1.50
34x3 1/2.....	6.50	1.60
31x4.....	7.00	1.65
32x4.....	7.75	1.60
33x4.....	8.50	1.70
33x4 1/2.....	9.00	1.75
34x4.....	8.50	1.70
35x4.....	9.00	1.75
34x4 1/2.....	9.00	1.75
35x4 1/2.....	9.25	1.80
36x4 1/2.....	9.50	1.85
38x4 1/2.....	15.00	2.50
40x4 1/2.....	15.00	2.50
42x4 1/2.....	10.25	2.00
35x5.....	10.25	2.00
36x5.....	10.25	2.00
37x5.....	10.75	2.20
38x5 1/2.....	15.00	2.50
40x4 Non Skid.....	15.00	2.50

Express Must Be Prepaid on Old Tires Sent to Us.

Special New Tires

32x4 Clincher.....\$10.00

Double tread Tires

Selected from best used material obtainable.
Reliners, \$1.25 Extra

Two tires, one with good top and other with good sidewalls are trimmed, cemented and sewed firmly together by Campbell lock stitch method, twelve to fourteen plies fabric making puncture and blowout almost impossible.

Size	Complete tire	You furnish one tire	You furnish both
28x3.....	\$ 4.15	\$ 3.00	\$ 1.50
30x3.....	4.75	3.35	1.50
30x3 1/2.....	5.80	4.25	2.00
31x3 1/2.....	6.50	4.50	2.00
32x3 1/2.....	6.75	5.25	2.00
34x3 1/2.....	7.00	5.60	2.25
21x4.....	6.95	5.75	2.50
32x4.....	7.15	5.65	2.50
33x4.....	7.80	6.25	2.50
34x4.....	8.00	6.45	2.50
35x4.....	8.75	7.15	2.50
36x4.....	9.40	7.50	2.50
33x4 1/2.....	9.25	7.60	3.00
34x4 1/2.....	9.65	8.00	3.00
35x4 1/2.....	10.15	8.20	3.00

MOTOR SALVAGE CO. 1425 S. State St. CHICAGO, ILL.

When Writing to Advertisers, Please Mention Motor Age

Parts and Repairs

Parts and Repairs

Parts and Repairs

PURITAN MACHINE COMPANY

NEW PARTS

BEHIND

WE DO

FOR

PURITAN EQUIPMENT

NOT

ALL CARS

WRECK CARS

ESTABLISHED 1901

18 YEARS IN BUSINESS

Send for our monthly bulletin "Wise Buys For Wise Buyers"

IGNITION MATERIAL

6 Volt Model G. G. Auto-lite Generator \$ 15.00

6 Volt Model G. H. Auto-lite Generator 15.00

Cuno Car Lighters for Maxwell and Dodge 1.95

6 Volt Ward Leonard starting motors 15.00

6 Volt Lighting Generator with attachments for Fords 23.00

Posch DU6 Magneto—New 40.00

Posch DU4 Magneto—Re-built 35.00

Dimmer Switches 1.00

2 Gang Lighting Switch with dimmer75

1 Volt K-2 Atwater Kent Unisparkers 10.50

6 Volt K-2 Atwater Kent Coils 5.00

STARTING AND LIGHTING BATTERIES—BRAND NEW—GUARANTEED BY THE MANUFACTURER FOR ONE YEAR.

6 Volt 80 Amp. \$ 25.00

6 Volt 110 Amp. 30.00

12 Volt for DODGE and MAXWELLS 36.00

ELECTRIC LIGHT YOUR FORD

Complete lighting system, including generator, complete storage battery, electric side and tail lamps, switches, wiring, etc. Everything complete installation. Regular price \$29. Our price, \$17.50.

SPECIALS

Timken Worm Drive Truck Axle, complete with hubs

and drums \$85.00

1-in. Model R Schebler Carburetors—Top Intake, brand new 12.50

Brand new late model 5 passenger Packard body, complete top and shield 200.00

5 passenger Studebaker body 50.00

SPRINGS FOR ALL CARS

Complete Steering Gears, left or right, Jacox, Gemmer and Warner makes 15.00

1 inch Kingston carburetors top intake 5.00

Stewart speedometer shafts 1.50

Bumpers for all cars 5.25

6 cyl. Lycoming Motors 150.00

18 inch Steering Wheel, with corrugated rim 2.75

Cushions for many makes of cars 3.50 up

RIMS AND WHEELS

All makes for all cars—Let us quote you prices

RADIATORS FOR ALL CARS

Brand new Honeycomb Type for all cars. Write for price list.

FOR MAWELLS

12 V Type CC Atwater Kent Systems, includes Coil, Distributor and Base \$ 15.00

6 V Type CC Atwater Kent Coils (slightly used) guaranteed O. K. 3.00

Wiring Harness, brand new. Front Axle Assemblies with Spindles, Nuts, etc., 60 in. Tread—brand new—less Hubs 10.00

Kelley and Stanweld Rims. 3.00

Lower Windshield Glass and Frame 3.50

Intensifier or Transformer Coils—used on Maxwells with Magneto equipment—new25

Touring car tops for Maxwells, made of best grade waterproof khaki—all complete with curtains, dust boots—brand new, price each 25.00

Gasoline Tanks—Cowl Type for 1915 Models, new 6.00

Honeycomb Radiators, for 1914, 15, 16, 17, 18 M Model 25 cars—new 41.50

Speedster Bodies for Fords. 60.00

Sport Bodies for Fords, with Top and Windshield 120.00

One-man Mohair Tops for Chalmers Touring Cars. 42.50

CRANK SHAFTS SPARK PLUGS DIFFERENTIALS PISTON RINGS STARTING MOTORS HUBS STEERING WHEELS MOTORS FRONT AXLES TIMING GEARS GENERATORS STEERING GEAR ACCESSORIES SPRINGS**AXLE SHAFTS WINDSHIELDS BALL CUPS WHEELS BEARINGS UNIVERSALS BRAKE LINING TOPS CLUTCHES PISTONS RADIATORS CRANK CASES RIMS TRANSMISSIONS FANS FENDERS TIRE CARRIERS TIRE COVERS GEARS**

PARTS, ACCESSORIES, AND SUPPLIES NEW AND USED

We have ready for immediate shipment a large stock of Magneto, Carburetors, Complete Motors, Bodies, Axles, Blacksmith Anvils, Spark Plugs, Electric Motors, Fuel Tanks, Vises, Speedometers, Lenses, etc., etc. We furnish everything for the motor car at suprisingly low prices.

Send for Bargain Price List

What do you need? Let us send you special prices. Get our complete list and look it over. See what you can save.

Write today

Auto Parts Co.

Houston, Texas

Samuel L. Winternitz & Company AUCTIONEERS

Largest Liquidators of Motor Plants
FIRST NAT. BANK BLDG. CHICAGO, ILL.

New and Guaranteed

GEARS

TRANSMISSION AND DIFFERENTIAL GEARS IN STOCK

FOR OVER 100 DIFFERENT MAKES OF CARS

BEVEL DRIVE GEARS FOR THE FOLLOWING CARS

Abbott
Allen
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Buick
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Crow
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Davis
Detroit
Dixie Flyer
Dort
Drexel
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Elgin
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Great Western
Halladay
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Imperial
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Monroe
FOR MANY
MAKES OF CARS

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R. C. H.
Regal
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Scripps-Booth
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Stoddard-Dayton
Studebaker
Velle
Warren-Detroit
Westcott
Winton

REAR AXLE SHAFTS

Prompt Shipments. Money Refunded on Parts Not Used, If Returned Within Ten Days. Liberal Discounts to Jobbers, Dealers, Garage and Repairmen
THE ABOVE IS ONLY A PARTIAL LIST. WRITE US YOUR NEEDS

AMERICAN GEAR COMPANY

Manufacturers and Distributors

2131 Michigan Avenue, CHICAGO, ILL.

HAL OWNERS

We can make immediate shipment of any part required in the repair of your Hal motor.
Don't pay a premium for, nor run the risk of using, second-hand parts when you can get NEW PARTS, exact duplicates made from original patterns, by ordering direct from the factory that built your motor.
Deal with headquarters and be assured of good reliable parts at a fair price.

WEIDELY MOTORS COMPANY

Indianapolis, Ind.

SAVE 25% TO 75% ON USED PARTS

We Have Large Stock of Brand New Maxwell and Overland Parts

Maxwell Rear Springs \$6.00

Maxwell Front Springs 4.00

Overland Axles—all models 3.75

Ford Rear Springs 7.50

Ford Front Springs 3.00

Overland Axle Shafts—any model 4.00

Studebaker Axle Shafts 4.50

Dodge Axle Shafts—all models 4.00

Chevrolet Axle Shafts—model 490 3.00

EUREKA AUTO PARTS AND TIRE CO. 111 West Michigan St. and 448 N. Illinois St. Circle 878

Klein Bros., Props.

Write today for prices of parts not listed

House of Nearly 3,000,000 Parts

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Parts and Repairs

Parts and Repairs

Parts and Repairs

**Prompt Service
Satisfaction Guaranteed****Overhauled and Guaranteed
MAGNETOS**

Bosch D. U. 4 Set	
Spark	\$22.50
Bosch D. U. 4 Variable	
ble	25.00
Bosch D. U. 6	27.50
Bosch D. R. 4	20.00
Bosch D. R. 4—2 spark	65.00
Bosch D. R. 6	25.00
Bosch D. 4	15.00
Bosch D. 6	16.00
Bosch D. 6—2 spark	45.00
Eisemann 4 Cyl.	12.00
Mea	10.00
Remy	5.00
Splitdorf	5.00

COILS

Bosch, Type A	\$ 6.00
Eisemann	3.50
Splitdorf	3.50

STARTERS

Gray & Davis	\$15.00
Delco	20.00
Jones Starter & Gen.	17.50
Apple Starter & Gen.	20.00

AUTO PARTS

FOR ALL CARS

New Gears and Shafts for 200 Cars
PREST-O-LITE TANKS MODEL B, \$4.00; MODEL E, \$3.00
Searchlight Tanks, \$2.00

**One-ton outfits for trailers or Form-a-trucks with 32x3 1/2
Solid Tires, \$75.00.**

EXCELLENT 2ND HAND TIRES AND TUBES
Obtained from Wrecked Cars—Solid Truck Tires

5% Off for Cash WRITE FOR PRICES Deposit Required
in Full with Order With All Orders

**MONEY CHEERFULLY
REFUNDED****MOTORS ONLY**

4 Cyl. Packard 30	\$90.00
4 Cyl. Excellior	75.00
4 Cyl. Pierce Arrow	90.00
1916 Briscoe	75.00
4 Cyl. Continental	
Model R	65.00
R. C. H.	65.00
Overland 59	60.00
4 Cyl. Ruttenger	65.00

RIMS

All Makes and Sizes \$2.00 up
All Parts for 2 Cyl. Grubowsky Trucks.
Front and Rear Axles, Axle Shafts.
Complete Rear Ends.
Transmissions — Universal Joints.
Bearings — All makes and sizes.
Differentials—Gears, Springs, Radiators, etc.

SCHEAFFER AUTO PARTS CO. 1610 S. State St. CHICAGO, ILL.

DEPENDABLE PARTS BARGAINS

WE LEAD IN PARTS FOR:

Buick 1917	Krit 1915	Cadillac
Kissell 1916	Overland 1915	Dodge
Dorris 1917	Ford	Hudson
Metz 1916	Mitchell	Chandler
	Maxwell	

We have a very large stock of parts. You are almost sure of getting just what you want from us. You will be pleased with our service and our goods. Your money refunded if you are not.

PARTS FOR EVERY CAR**STANDARD AUTO SALVAGE CO.****MAGNETOS****ACT QUICKLY—THESE ARE HOT ONES**

Bosch, high tension, D1	\$18.00
Bosch, high tension, D6	22.50
Bosch, high tension, DU4	32.50
Bosch, high tension, DU6	32.50
Bosch, high tension, DR4	22.50
Bosch Coils	6.00 to 9.00
Simms, 4 Cyl.	12.50
Eisemann	5.00 to 15.00

3931 Olive Street, St. Louis, Mo.

**Gears for Transmission
and Differentials
Our Specialty.**

We also carry used parts for the convenience of our trade when new parts are not obtainable. Call here first and save time, for we have the gear or part.

NEW GEARS

BARNEY'S AUTO PARTS CO., Inc.

233 West 50th St.,

New York City

**We Carry Gears for
Almost All Late
Model Cars**

Phone Circle 1689

PATHFINDER OWNERS

Buy your repair parts direct from
the manufacturer of your car.

We carry a complete stock of repair parts and can make shipment the day order is received. Our stock includes a complete supply of Weidely 12-cyl. motor parts.

THE PATHFINDER COMPANY, Indianapolis, Ind.

We Make Gears

**For 150
different makes
of automobiles
(750 models)**

**And furnish them when you
want them.**

See our full page advertisement in this
journal the first of each month.

Auto Gear & Parts Co.

295 Marietta St.	Atlanta, Ga.
AUTO GEAR CO. OF CHICAGO	Chicago, Ill.
1461 S. Michigan Ave.	
AUTO GEAR CO. OF LOS ANGELES	Los Angeles, Cal.
1213 S. Hope St.	
AUTO GEAR CO., INC.	New York, N. Y.
844 Eighth Ave.	

Low Prices on AXLES & PARTS (New or Used)

We manufacture axles for all standard makes
of cars at prices 25% to 50% lower than factory
prices.

5000 AXLES IN STOCK

**50% Off Retail List To Dealers and
Garagemen on Quantity Orders**

**Immediate Shipment
Send for price list**

New Springs 16c Per Lb.—Used 8c Per Lb.**5000 Springs in Stock****For All Makes of Popular Cars****New and Used Parts for All Cars****1000 Used Wheels in Stock****Expert Cylinder Boring and Fitting of Pistons**

All orders shipped same day received. All goods guar-
anteed—your money refunded at once if not satisfied.

BATTLE & HUBBARD

2218 Main St. Dallas, Texas

WRITE

Auto Parts Co.

FOR

Repair Parts

**We Can Save You 50% to 75%
OFF Manufacturers' List**

**SPECIAL — Garage and Repairmen — Our new
Bulletin of Used Parts and Prices is now ready
for you. With this Bulletin in your shop you
can supply repair parts for all makes and
models of cars listed and increase your repair
business. It is free. Write for it today.**

**SERVICE—Every inquiry will receive prompt atten-
tion. Orders shipped same day received. Satisfac-
tion guaranteed or money refunded.**

Auto Parts Company

4107 Olive Street ST. LOUIS, MO.

When Writing to Advertisers, Please Mention Motor Age

Parts and Repairs

BUILD YOUR OWN CAR

4-cyl. motors, new	\$60.00
3 Speed Transmissions, new.....	25.00
Demountable Wheels with five rims, new, set	20.00
Pressed steel frames	5.00
Steering Gears	5.00
Bodies, unupholstered, five passenger.....	20.00
Front axles	15.00
Rear axles	20.00

WE CARRY A GREAT LINE OF SUPPLIES — LOOK AT THIS

200 Rayfield or Stromberg carburetors, new	\$ 7.50
Battery Boxes, 9x9x10.....	.75
Disco starters with Bendix drive.....	10.00
Disco generators	10.00
Leece Neville starter and generator, new	12.00
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Flanders	Oakland	Studebaker
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Shipments made same day order is received. Remit-
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We guarantee our parts to be satisfactory or we will
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Buy your parts for all models of Pope
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410 Main St. Hartford, Conn.AUTO Save 50-90% PARTS
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Motors	\$25.00 up	Presto Tanks	\$ 4.50 up
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Can furnish parts for most any car—tires and tubes
Special attention to magneto, generator & starter service
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160 DIFFERENT MAKES CARS in PARTS
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Save 50 to 75% on Parts
FOR MOST ANY MAKE OF CAR
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Our Customers Stay and Boost A Trial Order Will Show You Why

A Complete Stock of Slightly Used and Factory Repaired

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A SATISFIED CUSTOMER IS OUR BIGGEST ASSET, THEREFORE
WE MUST SATISFY YOU

Size	Used Tire	New Tube	Size	Used Tire	New Tube	Size	Used Tire	New Tube
30x3..	\$4.50	\$1.95	32x4..	\$7.75	\$3.05	35x4 1/2..	\$9.25	\$4.25
30x3 1/2..	5.50	2.30	33x4..	8.50	3.25	36x4 1/2..	9.50	4.40
31x3 1/2..	5.75	2.40	34x4..	8.50	3.40	37x4 1/2..	12.25	4.50
32x3 1/2..	6.00	2.40	35x4..	8.75	3.50	35x5..	10.25	4.60
34x3 1/2..	6.50	2.60	36x4..	10.00	3.65	36x5..	10.25	4.70
31x4..	7.00	3.00	34x4 1/2..	9.00	4.15	37x5..	10.75	4.75

Send \$1.00 deposit with each tire ordered. Tires will be sent promptly, with privilege of examination, and balance C. O. D. Specify style of rim to avoid delay.

Our Used Tires are not guaranteed for any definite number of miles, but we will make reasonable adjustments on all tires that do not give service in proportion to the price paid, providing tires are returned to us by prepaid express. Is not this fair enough?

WE CARRY A COMPLETE STOCK OF NEW TIRES
WRITE FOR PRICES, STATING SIZE DESIRED

LINCOLN TIRE & SUPPLY CO.

1463 South Michigan Avenue, Dept. L. CHICAGO, ILLINOIS

TIRES AND TUBES**SLIGHTLY USED TIRES**

OBTAINED FROM WRECKED CARS AND
FACTORY REPAIRED

Size	Tires	Tubes	Size	Tires	Tubes
30x3...	\$4.50	\$1.35	34x4 1/2..	9.00	1.75
30x3 1/2..	5.50	1.45	35x4 1/2..	9.25	1.80
30x3 3/4..	6.00	1.50	36x4 1/2..	9.50	1.85
31x4...	7.00	1.65	38x4 1/2..	15.00	2.50
32x4...	7.75	1.60	40x4 1/2..	15.00	...
32x4 1/2..	8.50	1.70	42x4 1/2..	25.00	4.00
33x4...	8.50	1.70	35x5...	10.25	2.00
34x4...	9.00	1.75	36x5...	10.25	2.00
35x4...	9.00	1.75	37x5...	10.75	2.20
33x4 1/2..	9.00	1.75	38x5 1/2..	15.00	...

\$1.00 Deposit Required With Each Tire Ordered, Balance C. O. D., Subject to Examination. Specify Style of Rim.

AUTO NEEDS COMPANY

1602 Michigan Ave. Chicago, Ill.

NEW TIRES

NEW, FRESH STOCK
Exceptional Bargains

Size	Tires	Tubes	Size	Tires	Tubes
28x3...	\$8.60	\$1.85	35x4...	\$20.60	\$3.50
30x3...	8.37	1.80	33x4 1/2..	23.60	3.75
30x3 1/2..	10.80	2.20	34x4 1/2..	24.40	3.90
32x3 1/2..	12.70	2.30	35x4 1/2..	25.50	4.05
34x3 1/2..	14.80	2.70	36x4 1/2..	25.90	4.60
31x4...	16.65	2.85	35x5...	29.10	4.90
32x4...	16.95	2.90	36x5...	29.90	4.75
33x4...	17.70	3.00	37x5...	30.75	4.90
34x4...	18.10	3.10			

ADD 10% FOR NON-SKID

\$1.00 Deposit Required With Each Tire Ordered, Balance C. O. D., Subject to Examination. Specify Style of Rim.

**Good Double Tread Tires, All Sizes
Guaranteed 3000 Miles**

30x3	\$ 5.25	32x4	\$ 8.75
30x3 1/2	6.25	33x4	9.00
32x3 1/2	7.50	34x4	9.50
31x4	8.25	35x4 1/2	11.50

Refinner free with each tire. One dollar deposit with all C. O. D. orders.

123 N. Rose St. REBUILT TIRE CO., Kalamazoo, Mich.

TIRES—SLIGHTLY USED

30x3 1/2, \$5.00; 31x4 and 32x4, \$6.50 each; 33x4 and 34x4, \$7.00 each; 34x4 1/2 and 35x4 1/2, \$8.50 each; all NONSKID. Standard makes. 20 per cent deposit required on C. O. D. order. Big saving on all other sizes and tubes also. State size and bead of tire. Orders filled same day received.

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Tires

Tires

TIRES

JOB LOTS

Obsolete, Surplus Stocks and
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BROADWAY TIRE JOBBERS

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New York

40% OFF

List on

5000 Mile
Guaranteed

Standard Brand

TIRES

ARMSTRONG GREY TUBES
Guaranteed for One Year

OUR PRICES

Size	Ribbed	Non-Skid	Tube
30x3	\$9.12		\$2.00
30x3½	11.76	\$12.30	2.45
32x3½	13.89	14.55	2.55
31x4	18.15	19.05	3.20
32x4	18.48	19.38	3.35
33x4	19.29	20.22	3.45
34x4	19.77	20.73	3.55
35x4½	27.84	29.16	4.45

10% deposit required with order, balance C. O. D., subject to examination. Special proposition to dealers.

The Armstrong Tire Co.

1342-44 Michigan Ave., Chicago, Ill.

Phone Calumet 5212 and 2199

Good News!

This Substantial Reduction Is
Your Gain

Compare Our Prices
Then Order

QUALITY COUNTS

New Fresh Stock, Assorted Brands

Size	New Tires	Used Tires	New Tubes
28x3	\$7.80	\$5.00	\$1.75
30x3	7.60	5.00	1.75
30x3½	9.80	6.00	2.10
32x3½	11.55	7.50	2.20
34x3½	13.45	8.00	2.55
31x4	15.15	8.50	2.70
32x4	15.40	8.50	2.75
33x4	16.10	9.00	2.85
34x4	16.50	10.00	2.90
35x4	18.75	10.00	3.30
36x4	19.30	10.50	3.40
33x4½	21.45	10.50	3.45
34x4½	22.20	11.00	3.55
35x4½	23.20	11.00	3.65
36x4½	23.55	11.50	3.75
37x4½	24.95	11.50	4.30
35x5	29.10	12.50	4.40
36x5	29.90	13.00	4.85
37x5	30.75	13.50	4.55

Add 10% for Non-Skid Cases or Red Tubes. Special Prices to Dealers—Let Us Know Your Wants.

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10% Deposit Required with Order, Balance C. O. D., Subject to Your Examination and Approval.

SERLIN TIRE CO.

Incorporated

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PHONES: CALUMET 3407-3408

Standard Used Tires

Best Values Ever Offered for the Money

SAVE YOURSELF 75%

By Buying Your Summer Needs Now

Size	Used Tire	New Tubes	Size	Used Tire	New Tubes
30x3	\$4.50	\$1.75	34x4	9.00	2.35
30x3½	5.50	1.90	33x4½	\$10.00	\$2.50
31x3½	6.00	2.00	34x4½	9.25	2.60
32x3½	7.00	2.00	35x4½	10.00	2.65
31x4	7.00	2.15	36x4½	10.00	2.75
32x4	7.50	2.15	35x5	10.50	2.85
33x4	9.00	2.25	37x5	11.50	2.95

\$1 deposit required with each tire ordered, balance C. O. D., subject to examination. Specify clincher or straight side.

5% Off for Cash in Full With Order

GOODWAY TIRE CO.

1463 MICHIGAN AVE.

CHICAGO

No Deposit Required
ON OUR TIRES

Demonstrating

All Non-Skid **TIRES** All Non-Skid

They Are MUCH BETTER
Than the Ordinary Used Tires

Size	Tire	Tube	Size	Tire	Tube
30x3	\$6.50	\$1.75	33x4½	\$13.50	\$2.40
30x3½	7.50	1.90	34x4½	13.50	2.50
31x3½	8.00	1.95	35x4½	14.00	2.55
32x3½	9.00	2.00	36x4½	15.00	2.75
31x4	9.50	2.15	38x4½	22.00	
32x4	10.50	2.15	35x5	15.50	2.85
33x4	11.50	2.25	37x5	16.50	2.95
31x4½	12.50	2.35	37x5½	18.00	
32x4½	13.00	2.35	38x5½	25.00	

5% Off for Cash in Full with Order. Otherwise, goods shipped C. O. D., subject to examination. Specify whether clincher or straight side.

Royal Tire & Supply Co.

1461 Michigan Avenue

CHICAGO, ILL.

Cord Type Tires

REBUILT

New Rubber

3-PLY RELINER

Vulcanized in Each Tire

30x3½	\$9.95
32x3½	11.50
31x4	14.50
32x4	14.95
33x4	15.95
34x4	16.50
34x4½	18.50
35x4½	18.95
36x4½	19.50

Deposit of \$1.00 on C. O. D. orders

State whether S. S. or Clincher

YALE DETROIT CYCLE CO.

502-504 Grand River, Detroit

REAL VALUES HIGH GRADE NEW TUBES AND TIRES

Some PRICES on NEW TIRES and Tubes

Size	Plain	Non-Skid	New Tubes
30x3	\$7.55	\$8.90	\$1.70
30x3½	9.75	10.85	2.10
32x3½	11.35	13.10	2.25
31x4		16.80	2.60
32x4	15.15	16.95	2.75
33x4	15.95	17.85	2.85
34x4	16.25	18.40	2.95

10% deposit required with order, balance C. O. D., privilege examination.

Carl G. Wiesenmeyer

"The Tire King"

Springfield, Ill.

CORD & FABRIC

TIRES

We carry the Largest Stock of all Standard
Makes of Guaranteed Tires in the State.

We can offer you a savings on Solid and
Pneumatic Tires.

May We Quote You Prices?

ACORN TIRE & RUBBER CO.

1350-54 Michigan Ave. CHICAGO, ILL.

Special Bargains in

SLIGHTLY USED TIRES

The Kind That Will Satisfy All Customers

30x3	\$4.50	32x4	\$7.75	35x4½	\$9.25
30x3½	5.50	33x4	8.50	36x4½	9.50
31x3½	5.75	34x4	8.50	37x4½	10.00
32x3½	6.00	35x4	8.75	35x5	10.25
34x3½	7.00	36x4	8.75	36x5	10.25
31x4	7.00	34x4½	9.00	37x5	10.75

Send \$1.00 deposit with each tire ordered. Balance C. O. D., subject to examination. Specify if Clincher, Q. D., or Straight Side.

American Tire & Vulcanizing Co.

Phone: Calumet 5170

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There is a branch near you as noted in this advertisement. The Lawrence patented process eliminated reboring, therefore will save your customer the expense of buying new pistons and rings. In this process, we fuse silver nickel alloy then grind it flush with cylinder wall.

Cracked Water Jackets

are repaired by this process without pre-heating—insures against warping. We run a 24-hour service at our factory giving you the quickest kind of action. Write to the branch nearest you for full information. There is big money and satisfaction in this work for you.

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NEUPERT REGROUND CYLINDERS

ARE GUARANTEED. When your cylinders are returned to you, after regrounding in our factory, they are correct.

That is why we guarantee that, if for any reason at all, you find them unsatisfactory, you may simply return the new pistons to us, and we will refund your money without quibble.

We have the highest grade of labor, and a perfectly maintained battery of Heald grinding machines, which makes this guarantee possible. Does it appeal to you?

Write us. Send your work.

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CYLINDER GRINDING

New Oversize Pistons, Rings and Wrist Pins

Highest grade machinery and tool equipment, no makeshift tools. This equipment with our years of experience in the automotive business insures you highest grade work at the hands of experts. Work fully guaranteed. Patterns for all pistons, 25,000 piston rings and 5,000 wrist pins in stock. We are the acknowledged leaders in our line.

Aluminate Pistons and Connecting Rods

put six cylinder smoothness into four cylinder motors, give any motor more power, more speed, quicker get away and more miles per gallon with less bearing trouble.

Power Plus Cylinder Head for Ford Cars

keeps the motor cool, increases power and speed.

Expert Motor Building and Overhauling

Motors refined and tuned for speed. New and rebuilt motors in stock. Tell us your motor problems. Our increased equipment and space insures prompt service and perfect work.

Ask Our Customers

Green Engineering Company

Dayton,

Ohio

CYLINDER and CRANKSHAFT GRINDING

We offer you the services of expert mechanics, modern high grade equipment, and years of experience in this business.

Our special Light Alloy and Grey Iron Pistons insure more power and speed because of extreme accuracy and extra lightness.

Satisfaction and prompt deliveries
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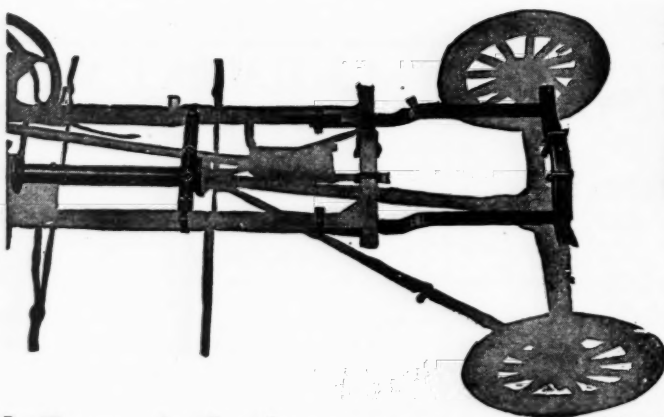
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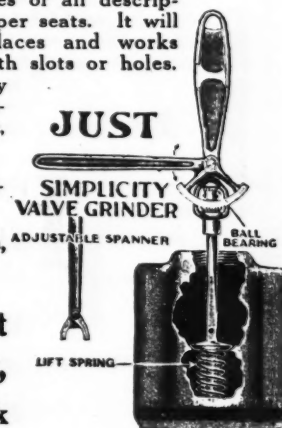
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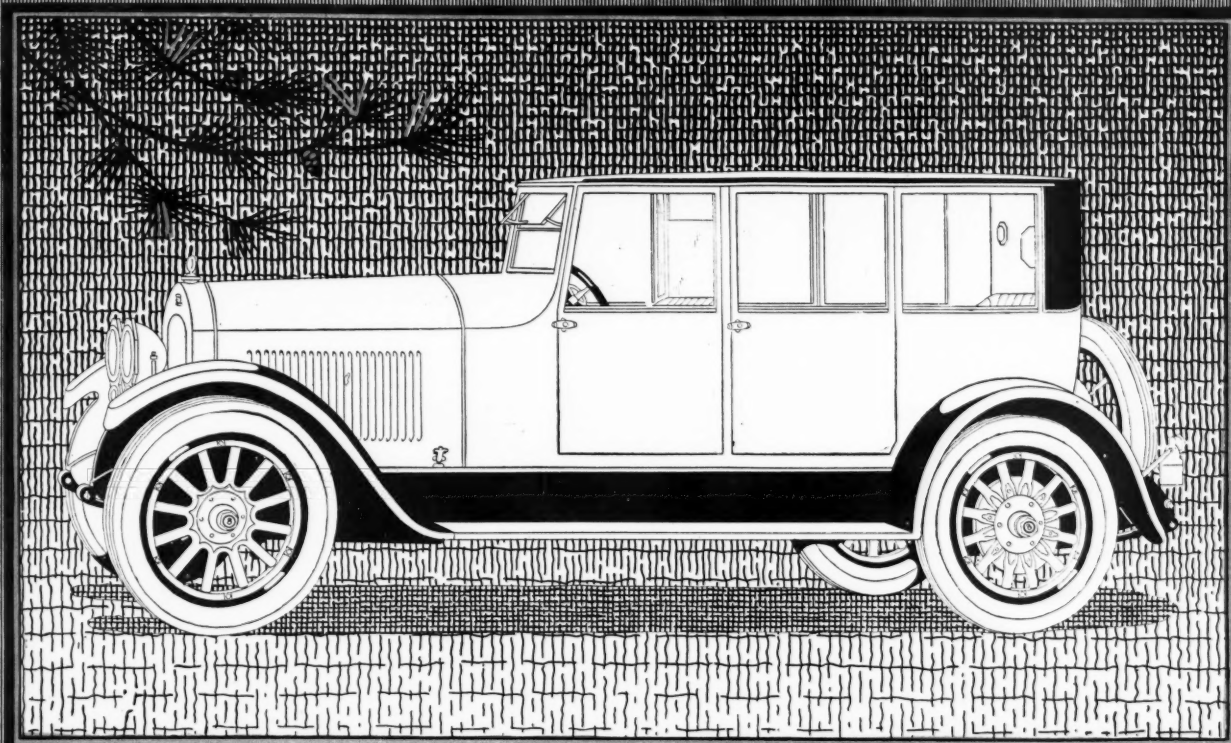
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